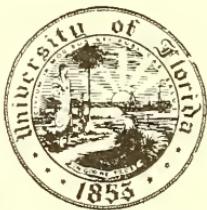


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BRAZIL IN THE MAKING

by

JOSÉ JOBIM

NEW YORK
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1943

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LATIN
AMERICA

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TO RAUL BOPP

MY FRIEND

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FOREWORD

FOR the past three years, through the graciousness of Foreign Minister Oswaldo Aranha and Ambassador Mauricio Nabuco, I have edited *Brasil*, the traditional publication of the Ministry of Foreign Affairs. When American publishers invited me to prepare a book on the development of Brazil, experience and material accumulated during my previous endeavors provided a logical source of reference. The collaboration of leading technicians such as Salomão Serebrenick and Harry Ikuta, to whose specialized knowledge I owe so much, is hereby gratefully acknowledged. To Messrs. Walder Sarmanho, Lourival Fontes, Major Coelho dos Reis, José Olympio, Octavio Malta, Manoel Pinto, Josias Leão, and José Auto da Cruz Oliveira, for the many constructive suggestions they have made toward the preparation of this book, I offer my sincere appreciation.

It must be pointed out that the colloquial terminology, "Estado do Rio" (State of Rio), which refers to the state of Rio de Janeiro has been adopted throughout the book for the sake of clarity, inasmuch as the state would otherwise appear as "Rio de Janeiro" and thereby be subject to confusion with the famous city of Rio de Janeiro, which is itself a federated unit. The latter is referred to as the Federal District throughout, except in a few places where specific mention is made of the City of Rio de Janeiro.

For the benefit of non-Brazilians the writer wishes to add by way of explanation of the Brazilian monetary system, which does not strictly follow the orthodox decimal system,

that *mil-réis*, name of the standard unit of currency, is translated as "one thousand reals," *mil* being "one thousand" and *réis* being the Portuguese plural form of "real." One mil-réis is written 1\$000 while one thousand mil-réis or one "conto-de-réis" (abbreviated form, "conto") is written 1:000\$000.

JOSÉ JOBIM

Editor's Note:

The Brazilian currency has been changed as of November 1, 1942, when the decimal system was adopted. The new unit—The Cruzeiro (Cr. \$1.00)—is worth one mil-réis.

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PART ONE

RECENT ECONOMIC
DEVELOPMENT OF BRAZIL

INTRODUCTION

An industrialized Latin America will move into the economic position now occupied by Germany and Japan, rather than act as competitor exporters in the United States.—DOUGLAS MILLER, *You Can't Do Business with Hitler*.

WITH the outbreak of the war in the Pacific, a veritable revolution has resulted in the economy of the Americas. The sudden curtailment of essential supplies from the Orient has caused the United States to turn to Latin American countries for these. In agriculture, the similarities in the tropical climate of Latin America and southern Asia suggest a satisfactory shift of supply sources without too great difficulties. In minerals it is to be remembered that tin and other critical ores are being obtained in South America in greater quantities, the problem being that of the working of the ores and their shipment.

The United States finds in the remaining American countries and possessions of the hemisphere the most accessible sources of raw materials, upon which great dependence is inevitable. In return, the Latin American countries find in the United States the largest source of the manufactured goods which they need.

Among the Latin American countries, Brazil no doubt offers the greatest and most diverse economic potentialities and the largest industrial organization, and adapts itself best and most readily to the overnight change in conditions. However, there is another aspect of the problem created by the peculiar combination of economic forces in the United States, which suddenly and drastically transformed several

of the largest North American peacetime industries into war industries. The United States is already feeling a shortage of some light manufactures. These very manufactures have, however, attained a development in some Latin American countries which would no doubt surprise many North Americans. It is necessary to understand the facts so that the United States may make full effort to achieve the desired ends of war with the maximum efficiency in continental forces and materials. This book, comprising a series of short descriptive units, attempts to make clear, in a compact form, the principal aspects of Brazilian industry, which has developed to a high level, if not the highest by Latin American standards.

Studies of manufacturing in Brazil have been few and uncritical, limited in scope and weak statistically, so that it has been difficult to find proper data on which to base this book. Hence, in many cases, recourse had to be had to data on foreign trade to support many known tendencies observed in manufacturing. However, in this respect the writer was fortunate, inasmuch as the changes in Brazil have been of appreciable magnitude and, furthermore, compressed within a relatively short period. Although highly accurate production data are lacking, the trends revealed by the Brazilian foreign-trade statistics have made up for many of these deficiencies, despite the possible exceptions which might arise with increased internal consumption—notable in recent years, it may be observed in passing.

The economy of Brazil is undeniably adapting itself with extraordinary facility to the new conditions created by the war. This adjustment would no doubt have met many difficulties had not the country adopted a policy in the early 1930's of attaining a strong position of self-sufficiency in many essential products. In this connection Brazilian imports were normally \$100,000,000 a year from the United States and were considerable from Germany, Great Britain, France,

and practically all Europe. Today, with all the other sources gone, Brazil is importing from the United States no more than \$100,000,000. The reduction of imports of products which could be supplied within the country, or replaced by others of domestic origin, is of signal importance now and permits a feeling of some security. In the light of the fact

BRAZILIAN EXPORTS DIVIDED BY ECONOMIC CLASS

CLASS	1939		1940		1941	
	1,000 Contos	%	1,000 Contos	%	1,000 Contos	%
Manufactured foodstuffs	236.7	4.3	324.6	6.5	784.8	11.7
Semimanufactures	438.7	7.9	728.2	14.7	655.3	9.7
Finished manufactures	47.5	0.9	129.8	2.6	369.0	5.4
Crude materials and crude foodstuffs	4,792.6	86.9	3,777.9	76.2	4,920.1	73.2
All economic classes	5,515.5	100.0	4,960.5	100.0	6,729.2	100.0

that this reduction of imports has been carried out without a corresponding decrease in consumption, it may be said that the transition has been exceedingly beneficial for the hitherto weak structure of Brazilian economy, dependent on only a few products till after 1931. Today, our exports of raw materials and foodstuffs are also more varied, more rigorously taxed, regulated, and classified to simplify their distribution, a development none too surprising for many countries but relatively new in Brazil.

Complementing this improvement is another, extremely significant: increased exports of manufactures. Brazilian statistics on *manufaturas* (finished manufactures—excluding manufactured foodstuffs, semimanufactures, or convertible materials such as iron and steel, vegetable oils, alcohol, leather, textile yarns, heavy chemical products, and paints)

show an increase from 0.3 per cent of total exports in 1936 to 0.8 per cent in 1939 and 5.4 per cent in 1941. If to the *manufaturas* are added all products obtained through an industrial process, they total today about 27 per cent of Brazilian exports, as against 13 per cent in 1939. In that year they amounted, in round numbers, to \$38,000,000 as against \$90,000,000 in 1941, an increase of 133 per cent. This is the result of Brazil's determination to industrialize her own resources. The benefits of such a policy can best be appreciated by the fact that in 1939 the average value per metric ton of industrialized products exported was \$56, as compared with \$180 in 1941.

For centuries Brazil sold its foodstuffs and raw materials in foreign markets, obtaining in the same markets manufactures and other industrialized goods. The fact that until recently between 70 and 80 per cent of Brazilian exports consisted of coffee, gives an idea of the weakness of the country's economy, which was based almost entirely upon foreign trade. Among imports, products of immediate consumption (certain manufactures of iron and steel, cotton, silk, and woolen goods, beverages, pharmaceutical products, wooden manufactures, clothes, etc.) occupied a prominent place. Machinery and tools were secondary, along with raw materials of iron and steel and heavy chemical products.

It can readily be seen, after reading this book, that the Brazilian struggle for industrialization is a very old one. The first phase of such a struggle has been won, and no one today questions the possibility of creating in this hemisphere a new and strong industrial center, side by side with the United States and Canada. We must bear in mind that an internal market—prime requisite of an industry—already exists in Brazil; and since the prudent social revolution that began in 1930 it has been increasing day by day. This is borne out by the fact that while overseas commerce has doubled in value since 1930, it has been surpassed by the

MARITIME TRADE OF BRAZIL FROM 1921 TO 1941
Quantity and Value

YEAR	1,000 METRIC TONS			1,000 Contos		
	Foreign	Coastwise	Total	% of Coastwise	Foreign	Coastwise
1921	4,374	2,168	6,542	33	3,398	2,212
1926	6,626	3,283	9,909	33	5,896	4,849
1930	5,712	3,265	8,977	36	5,279	4,468
1935	7,099	4,559	11,559	38	7,959	6,595
1936	7,607	4,730	12,337	38	9,164	7,588
1937	8,514	5,046	13,560	37	10,406	8,510
1938	8,941	5,213	14,154	37	10,292	8,200
1939	9,057	5,785	14,842	39	10,599	9,056
1940	7,573	5,937	13,510	44	9,924	9,753
1941	7,584	6,430	14,014	46	12,243	12,512

coastwise trade, which in 1941 represented about 51 per cent of the total maritime trade. In this connection, it is worthy of note that foreign trade, in tonnage, shows a tendency to decrease (in spite of the fact that its value is increasing), while the coastwise trade is steadily growing having advanced from 3,000,000 metric tons in 1930 to 6,500,000 in 1941.

Supporting and aiding these beneficial trends are Brazil's natural riches in agriculture and mineral wealth which have now begun to be rationally explored and intelligently developed. The temperate zone in southern and plateau Brazil assures supplies of its typical products while the tropical zone provides others, the number of which seems to be without end. A varied geological structure and natural mineral wealth offer opportunities many of which have begun to be utilized. A wise policy with regard to livestock has built up large herds of cattle, hogs, sheep, etc., which in value yield little in importance to agriculture.

Industrialization has proceeded at a relatively accelerated rhythm during the last five to six years, a rhythm which even the war has failed to upset despite the numerous difficulties which were suddenly encountered in obtaining production goods in the foreign market. In many lines, the hardships served only to stimulate long-planned dreams which lacked a proper start. New industrial installations today are marked less by their benefit in augmenting the present output of an already established industry and more by the fact that they are "new."

Despite the general favorable impression that our industrial progress leaves, there is little question that many products must continue to be imported. Thus a glance at the trends in the ten leading imports and the effect of the war on them, would reveal the main points at which Brazil still depends upon the exterior sources in order to sustain its present economy. A comparison of monetary values loses

much of its significance in war, naturally. For purposes of showing normal and war conditions the period from September of one year to the August of the following year was selected. Imports during one year of peace and two of war show the trends observed in the accompanying table.

The leading imports—machinery, tools, and equipment—show a substantial fall due to the decreased imports of the simpler and bulkier items, such as agricultural tools, which are now being manufactured in Brazil. We can get less of copper cable, generators and motors, textile machinery and equipment, sugar refining equipment, and, in general, many light products of simple manufacture. Outstanding among these imports in which a shortage is noticeable are precision equipment and highly technical machinery or instruments. Wheat has always been a source of anxiety and, despite measures taken to increase its cultivation in Brazil, continued importation is unavoidable. A wheat production campaign was introduced, and the use of manioc and other substitutes. But 70 to 80 per cent of the wheat consumed still continued to come from Argentina.

IMPORTS OF BRAZIL IN THE FIRST TWO YEARS OF WAR
(September to August Period)

PRODUCT	% OF TOTAL VALUE IN 1940-41	VALUE IN 1,000 CONTOS		
		1938-39	1939-40	1940-41
Machinery, tools, etc.....	19.5	1,008	862	922
Wheat.....	10.0	375	426	469
Automobiles and vehicles.....	9.7	572	526	460
Iron and steel manufactures.....	8.0	455	449	379
Chemicals, pharmaceutical products.....	5.4	277	313	256
Coal and coke.....	5.2	238	285	246
Gasoline.....	3.9	160	204	187
Fuel oil.....	2.9	105	170	138
Iron and steel semimanufactures	2.5	138	170	122
Wood pulp.....	2.2	78	99	105

The need of automobile and vehicle imports continues to be one of the weakest points in Brazilian economy, particularly as about 40 per cent of the total purchases are trucks. The difficulties since 1940 in importing iron and steel manufactures have actually presented serious problems. The installation of equipment for rails, wires, plates, and tubes, whether it be in the expansion of present facilities or through the erection of new plants, will no doubt overcome some of the graver deficiencies which appear in this vital field, particularly at this moment when the United States is diverting the whole of its production into the war industry. We must not forget that the Brazilian consumption of iron materials per capita is about twenty pounds, which is extremely low. The domestic chemical, pharmaceutical products, and perfumery industry has registered notable development in recent years, but the very magnitude of the imports of such products places them in the position of that of the precision and technical instruments and machinery industry, that of absolute dependence on imports in many essential products. The erection of an alkali and salts industry would aid materially in alleviating this economic insecurity inasmuch as no small volume of these imports is found in the purchases of caustic soda, soda ash, and some of the more common salts. The increased difficulties of England, our traditional supplier of heavy chemicals, with its shipments, are making Brazil more dependent on the United States market.

The problem of fuel—which includes the next three products of importance, coal, gasoline, and fuel oil—is whether the local manufacture of alcohol for mixture with gasoline and the supply of other fuels besides the increased output of coal will meet the need. As to liquid fuels, in the states of Bahia, Alagoas, and São Paulo, Brazil owns perhaps the richest deposits of shale oil, which for divers reasons are still unexploited. Practically unexploited—essentially for lack of

EXPORTS OF BRAZIL IN THE FIRST TWO YEARS OF WAR
(September to August Period)

PRODUCT	% OF TOTAL VALUE IN 1940-41	VALUE IN 1,000 CONTOS		
		1938-39	1939-40	1940-41
Raw coffee.....	30.0	2,147	1,900	1,728
Raw cotton.....	17.7	1,259	735	1,020
Meats.....	7.4	194	451	426
Carnauba wax.....	4.3	107	156	250
Hides and skins.....	4.3	236	245	248
Raw cocoa.....	4.1	207	208	236
Castor beans.....	2.5	75	132	146
Precious and semiprecious stones.....	2.5	24	80	145
Vegetable oils.....	2.3	65	96	132
Timber.....	2.0	106	86	116

equipment—are the petroleum reserves of Bahia, where many wells are producing as much as 150 barrels a day. Sea transportation is a serious difficulty, but a regular scheduled distribution of all available tankers which was recently initiated should reduce some inefficiencies and reassure the constancy of the supply, which has decreased because the United States has been forced to direct its shipments chiefly to the war zones. Imports of iron and steel semimanufactures, with few exceptions, are not a serious problem, because of the stability and the progress of the domestic industry. Until the planned wood-pulp and cellulose plant in the state of Paraná initiates operations, Brazil will encounter difficulties in obtaining wood pulp or paper due to the competition for shipping space. The only visible solution is a more close and equitable distribution of paper by rationing.

In general, one may say that the proposed plants for wood pulp, iron and steel, aluminum reduction, alkali and salts which are now under construction or are soon to be built

will do much to offset the shortage of shipping and lessen the burden upon North American plants. In some manufactured articles strict dependence is unavoidable for an indefinite period, since no means of relief are apparent. General opinion seems to favor the increased importation of production goods in preference to consumption goods, thereby decreasing the burden upon countries like the United States, England, and Canada.

By contrast with the decline in imports, Brazilian exports have increased recently, not only in total value but also in quality composition. Formerly the two principal export products of Brazil were raw coffee and cotton. Coffee, which accounted for as much as 40 per cent of the total in the 1939-40, fell to 30 per cent in the 1940-41 period. Raw cotton also experienced a fall from 23 per cent in the first period to 18 per cent in the latter.

EXPORTS OF BRAZIL
(First Quarter of 1941 and 1942)

COMMODITY	1941		1942	
	1,000 Contos	% of Total Value	1,000 Contos	% of Total Value
Raw coffee.....	591.4	43.6	635.3	35.2
Cotton piece goods.....	6.3	0.5	130.7	7.3
Raw cotton.....	198.8	14.7	118.3	6.6
Carnauba wax.....	71.0	5.2	104.0	5.8
Hides and skins.....	38.1	2.8	76.2	4.2
Raw cocoa.....	65.6	4.8	65.8	3.6
Canned meat.....	37.2	2.7	64.1	3.6
Timber.....	23.1	1.7	53.7	3.0
Castor seed.....	33.2	2.5	52.1	2.9
Frozen meat.....	6.4	0.5	42.8	2.4
Vegetable oils.....	13.7	1.0	40.2	2.2
Babassu kernels.....	12.4	0.9	33.2	1.8
TOTAL.....	1,097.2	80.9	1,416.4	78.6
Other commodities.....	258.7	19.1	385.6	21.4
GRAND TOTAL.....	1,355.9	100.0	1,802.0	100.0

There has also been a notable reduction in the export of oranges, bananas, and tobacco, while the items which have shown the greatest increases have been the industrial raw materials (manganese, iron, and other ores), rock crystals, precious and semiprecious stones, and beryllium among the minerals. Vegetable oils and the principal oil seeds are also experiencing a golden era, as is the wax with manifold uses, carnauba.

It will be noted that these increased shipments of industrial raw materials indicate possibilities of Pan American economic cooperation and the attainment of the greatest efficiency and mutual benefit in the use of transportation facilities while at the same time improving the general distribution of the raw materials available in the Americas. If Brazil succeeds in equipping herself industrially in the vital industries as she plans, there is little doubt that Brazilian industry will enter a period of unequaled progress.

When Japan declared war, about 35 per cent of United States imports were coming from Asia. It is clear that new sources of rubber and tin must be found. In addition, the demands of the armed forces and populations of the United Nations for arms and supplies are continually rising. Then the Latin American countries are suffering from a daily increasing shortage of necessities, due to the blocking of other sources. Those who know the potential capacity of Brazil would not hesitate to acknowledge that with relative facility Brazil could be transformed into an important raw material and foodstuffs center for many products formerly imported from the South Pacific. In addition, there is the ever present possibility of Brazil's becoming a useful element in bolstering the output of light manufactures.

The situation in the Pacific suggests that tropical products from that region will be cut off for a long time thereby making necessary basic modifications in the trade of the United States, which drew from that region, as we have stated, the

majority of her imports of some vital products—tin, tungsten, chromium, manganese, rubber, oil seeds and vegetable oils, textile fibers, cotton goods and manufactures, starch, tea, spices, medicinal plants and essential oils, to mention only the better known.

Except for tin and rubber (the production of this is very small, compared with American consumption), Brazil is in condition to provide, in large quantities, all the products heretofore imported from Asia.

Imports of vegetable oils by the United States attained an average of \$95,000,000 a year—equivalent to fourth, in value, of the total exports of Brazil. Today stocks of vegetable oils in the United States are very low. If the American authorities who are responsible for the war economy of the country were willing to supply the north of Brazil with capital, equipment, and technicians it would be easy to develop the industry of the babassu nuts. All the copra that came from the Orient, and today is very difficult to obtain, can be replaced by the babassu—as tung oil, monopolized by China, was replaced by oiticica oil. Brazil in 1941 exported approximately 400,000,000 pounds of vegetable oil, and oil seeds, compared with 260,000,000 pounds in 1940.

The United States is in need of certain cotton textiles and manufactures which Brazil produces, and exports in considerable quantities. Before the war the United States imported more than \$8,000,000 of cotton goods. Japan was then the principal supplier of bleached textiles, England of unbleached, and Belgium of printed, dyed, or colored textiles. The American production has increased tremendously but is still far from supplying the needs. The cotton textile industry in the United States is working at full capacity; that in Brazil is not, although production has considerably increased. It must also be pointed out that before the war American imports of manufactures and raw materials of jute, hemp, ramie, flax, and other fibers averaged \$90,000,000

yearly—jute manufactures alone accounting for \$50,000,000. India today is having difficulties in shipping its burlap, of which the United States formerly imported around \$45,000,000. In Brazil large and modern jute mills, which for many years have been operating only a few days each week for lack of markets, are today making burlap from domestic fibers and exporting it to the United States. This industry promises to have a great future in Brazil, its development having been retarded simply by lack of capital and markets. Brazilian exports of textiles of vegetable origin (cotton, jute, hemp, flax) have increased from \$1,500,000 in 1939 to \$11,000,000 in 1941. In the first quarter of 1942, cotton goods were second among Brazilian exports.

In the Occident, Brazil is the only producer of tea on a commercial scale. Tea stocks in the United States are low. In addition to tea, Brazil grows yerba maté, which has a large consumption in Argentina, Chile, and Uruguay. It should be comparatively easy to introduce yerba maté to the American public as a substitute for tea.

The United States formerly imported more than \$6,000,000 worth of starch from the East, particularly the Netherlands East Indies—whose production of cassava root is smaller than that of Brazil. Brazil may also supply in the near future some spices, such as pepper, of which the United States imported \$14,000,000 from the Netherlands East Indies, India, Ceylon, and Japan. The United States imported around \$12,000,000 of medicinal plants from Asia, Japan supplying about \$3,000,000.

Chromium, iron, and manganese ores, which the United States formerly obtained from the Philippines, are found in abundance in Brazil, whose shipments to this country in the first quarter of 1942 increased 90 per cent over the same period in 1941. The danger which threatens New Caledonia and the small production in Canada open new perspectives for the nickel of the states of Goiaz and Minas Gerais. Aus-

BRAZILIAN EXPORTS OF FINISHED MANUFACTURES
 (By Countries of Destination)

COUNTRY	1939		1940	
	Contos	% of Total Value	Contos	% of Total Value
Argentina.....	29,687	62.4	74,163	57.1
South African Union.....	100	0.1	7,482	5.7
Venezuela.....	1,743	3.6	7,357	5.6
Chile.....	556	1.1	6,877	5.2
Colombia.....	2,090	4.3	5,015	3.8
Peru.....	532	1.1	3,239	2.4
Mexico.....	305	0.6	3,200	2.4
Uruguay.....	1,238	2.6	2,965	2.2
Paraguay.....	1,493	3.1	2,547	1.9
United States.....	3,536	7.4	2,729	2.1
Total, including others.....	47,552		129,798	

tralia is an important source of rutile and other titaniferous minerals, which are also found in substantial quantities in Brazil. The urgency of a more detailed study of these minerals and other raw materials is made apparent by the fact that the available stocks of many of these products in the United States can last but a few months.

Hides and skins also are needed by the United States. Brazil can supply both crude and tanned hides. Boots, sheets, shoes, and rubber goods made in Brazil would no doubt be of considerable assistance in supplementing the total output of the hemisphere.

The salient fact with regard to Brazilian manufacturing is that it is still operating for a limited market, inasmuch as the primary objective in practically all cases is to fill Brazilian demand and attain self-sufficiency. As a result, there has been little concerted effort to win export markets for our industries. That there has been a gradual penetration of

foreign markets is apparent in the rise in the exports of manufactures.

This increase, however, is probably attributable largely to high war prices rather than to latent capacities suddenly developed. In any event, that some of this production may also be easily increased is a known fact, the economic soundness of which will no doubt be rigorously tested in the postwar years. Hence it may be said that Brazil's most practical move is to modernize and augment her equipment, which in some instances can be done by her own industry.

Douglas Miller writes in "You Can't Do Business With Hitler" (1942 edition):

Perhaps the most important phase of present-day economic life in Latin America is the growth of manufacturing. Since 1929 this has amounted to about 150 per cent in Brazil, 60 per cent in Chile, 60 per cent in Mexico, and equally large figures in Argentina and other countries. It would embarrass Hitler's future control of world economy were this process to continue. Germany has always been an exporter of staple manufactures such as steel rails, cheap cotton cloth, household utensils, shoes, paper, and bazaar goods. Latin America is rapidly taking over the manufacture of such items for itself. It is significant that the German steel interests have opposed the establishment of any steel industries in Brazil, whereas this has been encouraged by the United States Steel Corporation. There is a fundamental economic reason for such a difference between the German and North American attitude. The United States is an exporter not so much of manufactured staples as of manufactured specialities. We do not export petroleum, but high-grade lubricants; not steel rails, but machinery; not cooking utensils, but refrigerators; not bicycles and wagons, but automobiles; not newspaper print and stationery, but fountain pens, bookkeeping machines, and cash registers. An industrialized Latin America will move into the economic position now occupied by Germany and Japan, rather than act as a competitor for exporters in the United States.

We do not know of any synthesis more complete, more objective, or more impartial of the future industrial develop-

ment of Latin America and particularly of Brazil. The United States must try to understand the new Brazilian realities and interpret them in accordance with the events that the world is witnessing today, which mark a turning point in the history of this hemisphere. Today's war is not a war, but a revolution.

The present is an inheritance of the past. It is impossible to gain a true perspective of the development of a country without delving into her anthropogeography, localizing the influences that gave rise to her historical, economical, political, and social formation. Because of that, we have sought, before attempting to analyze the principal industries in Brazil, to outline the general evolution of the country since its discovery to the present day.

PART TWO

BACKGROUND OF THE
DEVELOPMENT OF TRADE
AND
INDUSTRY

I

THE LAND, THE CLIMATE, AND THE MAN

THE fifteenth century marked the climax of the Renaissance and hence the end of the Middle Ages. In that refrigerationless period, expanding and ambitious Europe depended, for the cooking and seasoning of half-spoiled meat, on the spices of the Orient. From Asia, prosperous Europeans became accustomed after the Crusades to receiving such spices as pepper, cinnamon, nutmeg, and ginger. Europeans in every kingdom and duchy became avid buyers of Eastern spices, indispensable to any escape from the monotony of the primitive diet. Silks, dyes, brocades, and precious and semiprecious stones were other items which fifteenth century Europe imported from Asia.

But the only known routes into Asia terminated at the eastern Mediterranean, and the capture of Constantinople in 1453 gave the powerful Ottoman Empire control over the entire Levant, blocking all routes to Asia. It was imperative to discover a new route to the Orient. Holland, which was soon to become a great maritime trading nation, was still limiting itself to northern Europe. France was busy consolidating itself politically. England had yet to experience the upsurge of creative energy and sea power which marked the Elizabethan period. Spain was a rising power in the western Mediterranean with ports on the still little known Atlantic. Italy's great trading cities and maritime traditions fitted it to lead in oceanic exploration, but an unusual combination of factors made Portugal the pioneer.

Portugal in the fifteenth century was a small, thinly populated kingdom, one of the youngest and poorest in Europe.

But its sturdy and alert people were already familiar with the sea and were not afraid of the wide Atlantic. Portuguese navigators were using the compass, introduced from China by the Moslems, who were soon to be expelled from the Iberian Peninsula. The times were ripe for great nautical achievements.

The Portuguese were favored by their geographical location as pioneers of oceanic exploration. In 1415 Prince Henry the Navigator founded at Sagres, in the most southwesterly part of Portugal and Europe, the first naval academy in the modern world and gathered a distinguished body of seamen and scholars to train the Portuguese in the arts of seamanship. Beginning in 1419, Prince Henry sent regular expeditions to explore the unknown coast of western Africa. The Portuguese pushed boldly out into the Atlantic despite the widespread fears and legends of monsters, discovering and colonizing the Madeira, Azores, and Cape Verde archipelagoes. In 1446 they reached Senegal.

Portuguese explorations of the dark continent continued even after the death of Prince Henry the Navigator. Farther and farther the bold and ingenious sons of Lusitania ventured, around the hump of western Africa, along the dangerous coast of what is now Nigeria and the swampy Cameroons, past the Equator and the Congo's mouth. In 1486 Bartolomeu Dias, blown far south by a storm, rounded the famous cape at the southern tip of the continent, to which his employer, the King of Portugal, gave the name it bears to this day—Cape of Good Hope. The route to India was at last discovered when Vasco da Gama led the first squadron of little vessels from Lisbon around Africa and across the unknown Indian Ocean to the Malabar Coast of India in 1498.

It was merely an accident that Columbus and Spain, instead of Portugal, discovered America. Columbus lived in

the Atlantic isles of Portugal many years, married a Portuguese woman of a noted maritime family there, and learned all the maritime lore of the Portuguese pioneers. Had it not been for Portugal, therefore, Columbus would not have discovered America.

As it was, the Portuguese carried back to Lisbon from Asia far greater riches in spices and goods than Columbus found in the Caribbean area. They found it necessary to overcome the hostility of the Arabs in all parts of the Indian Ocean and southeastern Asia. Arab religious and commercial influence penetrated clear to Mindanao in the Philippines, which is still Moslem. Christian Portugal not only explored the islands of all southeastern Asia and opened direct trade in precious spices and pepper but, during most of the sixteenth century, tried valiantly to create a commercial and spiritual empire in this region. Portuguese reached China and Japan, the first Europeans to do so by sea. Portuguese missionaries, particularly of the new and brilliant Society of Jesus, sailed from Lisbon to all parts of the Orient, and their books gave Europe its first knowledge of India, China, and Japan.

Little Portugal, with fewer than a million people, found it impossible to defend its Asiatic empire. Most of this was lost before the end of the sixteenth century to the Dutch and English, who sent more powerful and numerous expeditions. Only fragments remain: Macao on the south China coast; Timor in the fabulous Spice Islands; ancient walled Diu and Goa on the Malabar Coast, where hundreds of thousands of Indians have been converted to Christianity by the missionaries of Portugal.

The discovery of Brazil was a mere by-product of Portugal's overwhelming interest in the immensely rich trade with India and the Spice Islands. In 1498 Vasco da Gama had solved the problem of importing Oriental goods to Europe; and in 1500 a large armada under the command of Admiral

Pedro Alvares Cabral sailed from Portugal to occupy the principal ports of the territory discovered. In order to avoid the calm off Africa along Vasco da Gama's route, Cabral turned toward the west. One morning he saw land—saw a hill which he named Monte Pascoal. He anchored in one bay, Porto Seguro, in Bahia.

After a stay of only ten days, Cabral left what he thought to be an island (he named it *Vera Cruz*) to continue his journey to India. He commanded Gaspar de Lemos to return to Portugal with news of the discovery and a few vividly colored parrots, some monkeys, and fresh fruit as samples of its richness represented on this first voyage. The apparently limited wealth of the new territory, in comparison to India's gold, diamonds, spices, and precious stones, caused the news of the discovery to be received with little enthusiasm. It was only on the second voyage that an apparently valuable product was uncovered—the *páu-brasil* (Brazil wood), which because of its bright reddish hue (symbolic of dignity and nobility) and also because of the scarcity of red dyes, came to be highly prized on the Continent. The necessity of employing great numbers of men to extract the dye, the high cost of ships, and the consequent need to turn them to the best use, the relatively low price of the merchandise on the market, the low returns per ship dispatched (one-tenth of the profits from India), and, finally, constant raids of French and other corsairs on this sea lane influenced the Crown to grant a monopoly in this trade to the Lisbon merchant Fernão de Noronha, for a cash payment. Thus, Brazil made its debut in the Western World inauspiciously, not as a source of economic wealth but for its strategic position as a flanking base to the famous India route via the Cape of Good Hope.

The simple seminomadic life of the Brazilian Indians was in sharp contrast to the wealth of the highly organized Incas in the Andean region with their irrigation agriculture and

complex culture and society and of the Aztecs of Mexico with their advanced civilization. The Brazilian natives that Cabral found had few arts, practiced little agriculture and were split into small villages and tribes of hunters in the plains and forests. Life was easy in a land of abundant food and game. Work was governed by few needs, measured in terms of days and even hours. Hunting and fishing and the gathering of fruit, manioc root, and maize (all available with little cultivation) were the principal activities. An advanced art was the preparation of alcoholic drinks. Household utensils were practically limited to pots or earthenware, the universal and still popular hammock and straw matting, and small baskets. Clothing was simple—entirely absent in the tropical North and restricted to a few animal skins in the colder South. Although wild cotton was abundant in the land, weaving and spinning were almost unknown to the Brazilian aborigines, and the principal use of the fiber was as an incendiary arrowhead to set fire to enemy villages during the frequent tribal wars. In the present state of Maranhão it was even used as tinder.

Of the numerous tribes thinly scattered throughout the vast country the principal were the Tupinambas (commonly referred to as the "Tupis"), Potiguaras, Goitacazes, Tamoyos, Guaranis, Cariyos, Guianazes, Aimores, and Caïtes. They might, in a general way, be grouped into the docile, child-like Indians of the North and seaboard regions and the exact opposite type found in the interior, fierce, suspicious, and warlike. They all were nomadic—a characteristic which subsequently had a great influence on the opening of the interior of Brazil to the steadily increasing coastal population of Portuguese culture.

The new colony of Portugal—with enormous areas of virgin coastal and plateau lands, fertile and productive, blessed with tropical to mild climates which created only the problem of overproduction in crops and wild fruits and an

abundance of valuable products native to the country—suffered the essential lack of man power.

The colonists of the first years were either mariners or adventurers, or criminals or political offenders deported to Brazil. A few years later, there arrived a group which might in one sense be classed as refugees—the “New Christians,” or newly baptized Jews. They, with their commercial instincts and knowledge of the European market, initiated and built up the trade in tropical products and Brazil wood. Profits in this trade rose. A greater movement of trade and Portuguese emigration ensued, creating small population centers along the coast and leading to more visits of ships, some legal and others clandestine. The clandestine visits were often made by foreign vessels engaged in peaceful commerce or sometimes in piracy. French and other pirates increased rapidly in number and it soon became necessary to establish a land system known as *capitanias* (captaincies) in order to promote unity and colonization and defend the greatly coveted new colony. Of the fifteen areas bestowed on thirteen grantees, only two captainias, São Vicente (present state of São Paulo) and Pernambuco, prospered much. These were the chief sugar-growing captaincies.

The extreme looseness and decentralization of this early colonial system led to the adoption of a single central administration under a Governor-General; the first to hold the office was Tomé de Souza, who in 1548 chose for the seat of the government São Salvador, the present capital of the state of Bahia. With Tomé de Souza came approximately four hundred convicts, six hundred soldiers, some officials, and six Jesuits. This group was, in a sense, the second important group of colonists to settle in Brazil.

In Brazilian history, heroic and self-sacrificing Jesuit and other missionaries are credited with having accomplished great good by protecting the Indians from excessive suffering and decimation through enslavement on the coastal planta-

tions, by teaching them the domestic arts, and by persuading them to give up their nomadic ways and settle in sedentary villages, or "reductions," from Paraguay to the Amazon. At the same time, the Portuguese settlers were induced to abide by certain rules of discipline. The early missionaries were, in fact, the first to struggle for a Brazil for Brazil.

Economic forces worked to defeat the idealistic aims of the early missionaries. Sugar cane, well adapted to the new land, grew so well and returned such huge profits that it led to the rapid expansion of plantations and accentuated the great Brazilian problem—lack of man power. Because sugar growing is hard, hot manual labor and the desire of all the colonists was to escape tilling the tropical soil while dominating and supervising others who would do the work, slavery was the inevitable solution. In the middle of the sixteenth century slave traders began to bring boatloads of Negroes from all parts of Africa. The number of slaves increased as the years went by, and the economy of colonial Brazil passed through the sugar, mineral, and coffee cycles. The country became ever more dependent upon Negro slave labor. It was only in 1850 that Brazil ended the importation of human livestock from Africa; and in that span of approximately three centuries many millions of Negroes had been brought in. This third wave of immigration was probably the best suited to tropical and plateau Brazil because of the Negroes' quick adjustment to the land and climate, and because of their knowledge of metalwork, agriculture, and the breeding and care of domestic animals. The millions of Negroes were in striking contrast to the dominant Portuguese groups and to the native inhabitants, being a cooperative, gregarious people with a great capacity for labor in the mines of the interior and on the plantations of the seaboard, the littoral, cradle of modern Brazil.

The three—the Indian, the Portuguese, and the Negro—are the basic bloods which form the Brazilian of today. Al-

though it would seem at first as if there would be a dominance of the Portuguese over the Indian and the Negro in a country so large as Brazil, with difficulties in communication and transport, there is no evidence of this. The Portuguese, ever since arriving in Brazil, have mixed freely with the aborigines, forming what is known today as the *caboclo*, and with the Negroes to create the mulatto. Absorptiveness is characteristic of the Portuguese, in whose veins runs the blood not only of the ancient Iberians but also of Phoenician, Carthaginian, Celtic, Roman, Gothic, and Moorish migrants to his land. Polygamous tendencies, the ability to mix with any race, and great mobility and adaptability were qualities in the Portuguese which rapidly broke down any colonial color line. The great migrations within the country, including the spectacular gold and diamond rush to Minas Gerais, did much to unify the immense country despite the remarkable contrasts in people, language, and customs from north to south and from east to west. Social strata were broken down. The proportion of the population that was Portuguese, Indian, or Negro decreased as the new Brazilian people fused from these three cultures—with the Portuguese dominant, of course.

Migration into Brazil's enormous interior, like that of the hardy part-Indian Paulistas (named from São Paulo province, and comparable to the French Scotch-Irish frontiersmen in North America), was, however, a product not only of the mobility of the inhabitants but also of the sharp economic changes which the country underwent before the twentieth century.

In general, the first inhabitants would burn the forest where they were, clearing crude corn and manioc patches, stay a year or two in that locality, and then move on. Organized cultivation other than by fire and the hoe was unknown. The seventeenth century, in which sugar was the principal commodity of Brazil, was marked by the rapid rise

of the Northeast, in which the lack of labor brought the introduction of Negro slaves and the immigration of greater numbers of Portuguese. In 1630 the Dutch conquered Pernambuco, the center of the sugar industry, where they remained for about thirty years. When the Brazilians expelled them some of the Dutch went to Dutch Guiana, Curaçao, and the West Indies, where they used their acquired knowledge of sugar growing to threaten the Brazilian monopoly. Brazil was the world's sugar bowl for over a century until the rise of the British and French West Indies, which rivaled it in the eighteenth century in the number of slaves imported from West Africa. It was from the sugar-growing region that much internal Brazilian migration came. The first visible movement was that to empty territory inland from the coastal sugar-growing area, as a part of the expansion of the industry and the need for more land, labor, and oxen. Horses, mules, asses, and cattle were raised in the near-by interior. Gradual expansion forced the raisers of livestock on unfenced lands to penetrate the wide-open *sertão*—the interior, with its savannahs, scrublands, and plateaus.

The economic cycle of sugar terminated with the drastic fall in prices and the new competition from the Antilles. However, Brazil seemed to have been born under a lucky star: no sooner did this sugar prosperity end than the roving *bandeirantes* of the south of São Paulo found gold and precious stones in the Brazilian plateau—principally in what is today the eastern part of Goiás and mountainous central Minas Gerais, the highest part of Brazil. A feverish gold and diamond rush by Portuguese and Brazilian seekers of quick riches began. Whites and slaves swarmed from the coastal cities and from the South, but the largest number came from the sugar zone through the São Francisco valley into Minas Gerais in 1695–1760. Boom towns and rough mining camps rose throughout the hinterland, as in California in 1849. In order to augment

production, increasing numbers of Negro slaves were imported.

The population thus moved south and west in the first half of the eighteenth century. The early production, which was only alluvial gold, began to decline by the middle of the century as thousands of Paulistas and Portuguese prospectors and scores of thousands of slaves exhausted the gravels and stream beds. "High lodes" and deep hard-rock mines were also exploited. The diamond boom in northern Minas Gerais began in the 1720's and overlapped the gold rush by several decades. Diamond digging and the diamond zone were declared royal monopolies by the Crown in distant Lisbon. Slaves, supervised by Portuguese soldiers and royal officials, washed tons of gravel a day for diamonds. Gold and diamonds from Minas Gerais enriched Portugal and aided the rebuilding of Lisbon with fine plazas and avenues after the terrible earthquake of 1755.

After 1760 the mining zone of central Minas Gerais declined, and there was an exodus to the fertile agricultural lands of São Paulo and the coastal regions. Then, late in the eighteenth century, in the Parahiba valley of the Estado do Rio, began the sway of coffee, whose magnetic power practically equaled that of the other cycles. The new currents were from the exhausted mining zones and from the northern regions, where the culture of tropical products had fallen to low levels. Coffee found, however, better growing conditions in the plateau regions of the state of São Paulo with its extremely fertile *terra roxa* (red soil) and consequently high yields. Bad methods combined with erosion to cause the decadence of coffee in the Parahiba valley. Depopulated areas in Estado do Rio increased, and by the end of the nineteenth century coffee cultivation had almost completely shifted to São Paulo. Minas Gerais also suffered from this dislocation of coffee planting, as did the Northeast, which suffered from periodic droughts. Toward the end of the nine-

teenth century, the once populous Northeast was radically affected by the sudden riches yielded by the wild rubber trees growing in the enormous jungle empire of the Amazon valley as far inland as the Territory of Acre next to Bolivia.

In the late nineteenth century, the rapid increase in Brazilian coffee and agricultural output and the urgent need for rural labor stimulated the state of São Paulo and the Federal Government to encourage immigration and colonization by paying steamship fares, granting lands, and transporting European immigrants to the colonization zones. The temperate climate of the states of the extreme south attracted many Germans, Italians, Syrians, Poles, Portuguese, and Spaniards, while the majority of the immigrants to the state of São Paulo were Portuguese and Italian peasants. Thousands of Japanese settled in rural São Paulo. Some southern Europeans settled in Minas Gerais. Immigration was overwhelmingly to São Paulo (half of the total) and South Brazil. Despite the immigration of these foreign elements, there was no noticeable change in the economy of the country, so great was the need of labor in the coffee plantations. It was only in the 1930's that there began to be a distinct diversification in both agricultural and industrial production, which apparently is tending to stabilize Brazilian population as it was, say, in 1935, because of greater economic opportunities.

Present-day internal migrations may be said to be local in character inasmuch as the industrialization of the country is drawing the rural population to the factories and shops of the urban zones all over Brazil, but especially in the advanced South. Furthermore, once prosperous and fertile agricultural zones have gradually become marginal producers, and there is also a visible trend of agriculturists to seek new lands in the interior of the country. These migrations, it may be said, develop from strictly economic causes and therefore tend to disintegrate once solid racial blocs such as the Italians in São Paulo and the Poles in Paraná.

However great may have been the influence of these internal migrations and the high degree to which mulattoes, Europeans, and native whites mixed, it is evident that the inherent differences in the white, the Indian, and the Negro prevented the rapid evolution of a typical Brazilian. Another factor was the immensity of the country, which is the third largest in the world. Caucasian Brazilians predominate in urban residential districts and as planters throughout Brazil, in much of Minas Gerais and in São Paulo and all of southern Brazil. The Indian, because of indolence, nomadism, and lack of robustness was displaced in coastal Brazil by the Negro and survives as a remnant mixed with white and mulattoes in Amazonia and the thinly populated plains, plateaus, and forests of the interior. The largest concentrations of Negroes and mulattoes are found in the coastal agricultural areas, in the mining zones of Minas Gerais, and in such cities as Recife, São Salvador da Bahia and Rio de Janeiro. This distribution of mulatto and part-Indian groups in heavy concentrations has retarded the fusion of the three races into a common and typically Brazilian type evenly distributed throughout the whole country. The most important elements in the evolving Brazilian race and culture are contributed by the Portuguese and other Latin European colonizers of Brazil. The present ratios of races are roughly estimated to be as follows: white, 55 per cent; mulattoes, 26 per cent; *caboclos* (white-Indian), 10 per cent; Negroes, 8 per cent; Indians, 1 per cent. The preponderance of the white race will, in all probability, tend to increase gradually in the years to come inasmuch as Negro immigration ceased about 1850 and Caucasians have better health and a far lower mortality rate than mulattoes and *caboclos*. The natural increase of the white race and the steady stream of immigration from Europe in the past fifty years and in the future insure the continued "Caucasianization" of Brazil.

The territorial expansion of Brazil, carried out by the

bandeirantes in the seventeenth century, when the population of the country did not exceed 100,000, marks one of the most fascinating episodes of the American history, being just as interesting and as far-reaching in its consequences as the feats of the pioneers of the United States. The *bandeirantes* were adventurers who explored immense areas of tropical jungle in search of gold, precious stones, and Indians, whom they captured and enslaved to the great horror and opposition of the Jesuit missionaries. As they progressed through the hinterland they left behind small nuclei of population which later became towns and large cities. They had no respect for laws or treaties, and wherever they went, they conquered. This explains why they were bold enough to invade Spanish colonies, and also why today Brazil touches on all the South American countries except Chile and Ecuador. They made Brazil the country the third largest country in the world with an area today of 3,275,500 square miles, or 9 per cent of the land area of the earth and 48 per cent of that of the continent of South America. Triangular in shape, much as the continent itself, Brazil is bounded on the west by the Spanish-speaking Andean countries, on the east and northeast by the Atlantic, and on the north by the plateau highlands of the Roraima and the Guianas. A closer look at the country, however, discloses that, as a unit in itself, its surface is exceedingly varied from the low coastal plain and the periodically flooded plains of enormous and empty Mato Grosso, to the Pico da Bandeira, Mount Roraima, or the Pico do Cruzeiro, all of which are mountains over 8,000 feet high. From its lowest to its highest elevations, Brazil has every variety of topography, vegetation, climate, and natural resource. *Serras* (mountain ranges) such as the Mantiqueira, Caparaó, Orgãos, and Bocaína form the highlands of eastern and central Brazil. To the extreme north are wild and little known Guiana highlands lying along the Equator, true Indian country, silent and empty.

The Amazon lowland, formerly an ocean bed, centers about the river of that name which in its extension within Brazil alone is more than 3,000 miles long and falls in this great distance but 30 feet. Sailing up the southern tributaries of the Amazon, themselves enormous rivers, one encounters almost without exception cascades or rapids which mark the fall line between the Amazon lowland and the central plateau, an elevated region which occupies a great rich part of Brazil and is bounded on the west by the Mato Grosso lowlands and on the east by the Coast Range (*Serra do Mar*). As if it were a natural wall built in close to the sea, the Coast Range, which in some points attains an altitude of nearly 9,700 feet, is one of the great blessings and great obstacles of Brazil. While offering the advantage of exceptional natural beauty and superlative waterpower, the steep Coast Range obstructs transportation. Its short, swift rivers are seldom navigable far. Railway or truck transportation must contend with steep grades and sharp curves. On the leeward side, the value of the gradually sloping plateau considerably ameliorates the difficulties but on the other hand forces the rivers to flow westward and away from the populous coastal belt. The coastal plain, broken in places by the protrusion of jutting mountain chains, as at Rio and Vitória, is generally narrow and in many places consists only of long sandy stretches or rock-bound coast.

The great latitudinal extension of Brazil from a point a few degrees north of the equator, that is, in the Northern Hemisphere, to thirty-two degrees South latitude, in the Temperate Zone of the Southern Hemisphere, endows Brazil with an exceptional north-south extension unequaled in the world. Agricultural possibilities almost without limit exist in a land where, as has been mentioned, the problem is the exuberance of nature and the fertility of the soil. But, invariably, North Americans draw false conclusions from the largeness of the area of Brazil which is tropical and sub-

tropical. Among the widely held false ideas is that northern Brazil and Amazonia are extremely hot and humid. Here attention must be called to the fact that the geographic equator and the thermic equator do not coincide: the latter actually passes through Panama and Central America and not through Brazil. Still another factor is the altitude of the major portion of the country which, excluding the coastal belt and the Amazon lowland, may be considered as a plateau region. The 4,950 miles of coast, with almost continual land and sea breezes, and the extensive river basins, with dense vegetation, are other factors which prevent excessive temperatures. Deaths due to heat are unknown, while sun-stroke results from carelessness rather than climatic severity or physical debility.

Various modifying factors affect the temperate areas in Brazil. The country is in the Southern Hemisphere, whose large oceanic areas impart greater regularity and moderation to the climate. Cyclones, hurricanes, and freezing cold are unheard of in this zone. Brazil is a geologically mature and subsiding land mass free of earthquakes, which are common only in the Andean republics.

To the rather even climate of Brazil there has come to be attached the derogatory characterization of invariability. Many a foreigner reacts unfavorably to the Brazilian tropics and looks forward to the coming of the "less warm" season. However, heat and climatic uniformity in the tropical North do not hold for the plateau and the South. Outside the tropics there are diurnal variations of from ten to fifteen degrees, aided almost fortnightly by cooler spells or by rains with substantial fluctuations in the temperature.

The glib phrases "tropical diseases" and "health hazards of the tropics" have little foundation, for health in tropical Brazil is actually affected adversely by only one disease, malaria. Rainy sections of the North, the low-lying interior

and Northeast provide numerous breeding grounds for the mosquito, especially in damp, densely vegetated parts.

Malaria's principal victims are the rural inhabitants. The Administration, however, is not indifferent to this hazard and has already successfully wiped out the deadly mosquito *Anopheles gambiae* (brought from Africa accidentally by transatlantic planes in the 1930's) after it threatened the entire Northeast. The Brazilian Government has also improved health and sanitation in all large seaports, ridding them of both malaria and yellow fever. In passing, it may be noted that the government health service to curb yellow fever is one of the most complete in the world. Important steps have already been taken to combat malaria by the drainage of the Fluminense lowlands near the Federal Capital while in the Amazon valley the first steps have already been taken near Belém, capital of the state of Pará. All the splendid health activities of the government have been aided by the Rockefeller Foundation, which has sent North American doctors and generous financial support to Brazil for decades.

Tuberculosis, which takes over a hundred thousand victims annually in Brazil, is rooted in wrong nutrition, which should not exist in a land of such plenty. In recent years Brazil has greatly increased its industrial output, making heavy demands upon its rural population, which suffers from low income and illiteracy and is susceptible to tuberculosis. After dietary studies over a period of years, a large-scale program recently initiated is expected soon to disclose concrete results. Prophylactic measures have also been undertaken to discover the disease in its first stages and to eradicate it.

The other important diseases in Brazil which take a high death toll are pellagra, syphilis, leprosy, and infantile ailments. While less fatal than tuberculosis, these maladies provide food for serious thought. It is to be noted that climate is a minor factor in these.

While nature, on the whole, has been lenient and generous with Brazil, in the course of years drought and man-made disasters have brought serious problems to various sections of the country. One may point to the terrible periodic droughts of the Northeast and to deforestation, floods, and erosion. The "Baixada Fluminense" (Fluminense Lowlands), a marshy, malaria-ridden zone near the city of Rio de Janeiro, was of a natural consequence. Floods have recently been frequent in South Brazil and Minas Gerais. In the Amazon region of the tropical North, sanitation is a grave problem.

In the Amazon, health and sanitation are often dismissed by noting the alleged illiteracy and indolence of the inhabitants. Life is easy, and Nature provides fruit and fish for all at the cost of little effort. Hard economic activity is not needed to insure a living. There is some truth in this simple explanation, but in seeking the cause of human lassitude and inactivity one is struck by the enormous natural wealth which goes unutilized. Many inhabitants of this rain forest region, in contradiction to accepted theories, struggle to improve their economic status. Deeper study shows that no small part of tropical enervation is caused by bad diet and malaria, with their debilitating effect.

As President Getulio Vargas aptly said, in referring to the development of the Amazon region, "It will fill pages, not merely in history but in civilization." At present a well planned offensive by medical and sanitation experts is under way beginning from the mouth of the Amazon in the state of Pará, gradually working up river to combat malaria and ignorance of diet and sanitation. This means the destruction of malaria mosquito breeding zones, particularly swamps, and the facilitating of drainage and of education in better health of the *caboclos*.

Farther south, in much of the tropical zone, the problem is essentially man-made. Excessive clearing and burning of

the forests have created the well known brush and scrub land, caatinga, with consequent droughts and floods in the plateau states of Pernambuco, Bahia, Goiaz, and Minas Gerais.

In Ceará, Piauhy, and other northeastern states, drought is due to the periodic failure of the trade winds—sometimes for a year or more in Ceará. The Inspectoria Federal de Obras Contra as Secas (an agency of the Brazilian Government comparable to the United States Bureau of Reclamation) has constructed nearly three hundred dams and opened hundreds of miles of irrigation canals in the semiarid Northeast. Wells also play an important role in supplying water, and more than 2,000 of these have been drilled. Complementing this action of a direct nature is the expansion of agricultural education, the study of the possibilities of raising more textile plants and fresh vegetables and fruits and increasing their economic utility, the teaching of dry farming and scientific erosion prevention, and the introduction of products which withstand semiaridity, such as dates, certain types of cotton, oiticica, tomatoes, and guava. The Inspectoria has also opened hundreds of miles of roads in a region of slow mule and oxcart trails. A great cooperative spirit, particularly characteristic of the "Nordestino" (person of the Northeast), has brought to hand the benefits of group purchases of implements and equipment which have mechanized agriculture in many regions, particularly through the so-called rural cooperatives. Government experimental stations are relatively abundant in that region while pest and insect study have been carried out with conscientious efforts. This challenge by the government to certain hostile aspects of nature is one of the most brilliant yet undertaken in Brazil, where the war of man against an overexuberant forest and insect life is already over four centuries old.

Another campaign in this war which competes in brilliance

is that in connection with the Fluminense lowlands, a problem in complete contrast to that of the Inspectorio in the semiarid Northeast. Here the fundamental difficulty was to drain bogs far larger than Rome's Pontine Marshes. The rain-catching Coast Range, which rises abruptly from the lowlands, sends torrents to the plains, where these turn into sluggish streams, meandering through dense vegetation and forming swamps. Malaria ran rampant for many years after the peaceful liberation of the last remaining slaves in 1888. (Previously it had been to the interest of the fazenda owners of the region to maintain drainage canals and prevent the breeding of the malaria-bearing mosquito.) The period of negligence has been followed recently by a program of land reclamation, flood control, drainage channels, and the recovery of a potentially rich area close to the capital of Brazil. More than fifteen hundred square miles of land have already been reclaimed, and colonization of this area has been initiated with absolute security from malaria. Besides the planting of garden crops which are so important in supplying fresh produce to the two million people in the near-by Federal District, efforts have been made to foster the breeding of livestock. Cattle are well adapted to this region, which in earlier days was one of the most famous in all Brazil for fattening livestock. Fruit culture has also been initiated, while the lagoons, principally the Araruama Lagoon near Cabo Frio in Estado do Rio, are now important in salt production. The Pontine Marshes Reclamation Project, the pride of Italian Fascism, is dwarfed by the Baixada Fluminense work, which is twenty-seven times as large.

The floods of the Extreme South are of very recent origin, which proves that the problem is man-made. The two recent floods in the zone of the Porto Alegre and Pelotas are attributed chiefly to excessive clearing of trees and brush. Reforestation to remedy this situation is under consideration.

Large countries naturally contain large rivers. The role

played by these inland waterways has been important in the history of Brazil, although their future use in the case of Brazil may be still larger and more valuable. It was in 1854 that the first railroad was constructed in Brazil—a line only a few miles long near Rio de Janeiro. Until that time, practically all transportation was by sea, by river, or overland by pack trains of mules. The Atlantic seaboard, relatively free of storms and with many natural harbors, assured rather free access from one port and state to another along the coast of some five thousand miles. Inland transportation, however, was comparatively difficult, inasmuch as much of the land is exceedingly rough or wooded and plains are few; for that reason it was heavily dependent upon the rivers till recently. The possibilities which a hydrographic map seems to show for Brazil's internal transportation are enormous, for there is a veritable network of rivers throughout the country, and the tropical or subtropical climate seems to insure ideal rainfall to maintain the flow needed in ordinary navigation.

Of the twenty thousand miles of navigable rivers, 58 per cent is accounted for by the Amazon Basin. Next after this important network are that of the Northeast, and the São Francisco Basin in the Northeast, with 11 and 10 per cent respectively. The Paraná system in the South with 8 per cent of the total is the fourth basin in importance. The prodigious flow of the Amazon carries its waters hundreds of miles into the Atlantic. The Amazon system, of course, forms the principal means of transportation of northern Brazil, where railway mileage is less than 200 in an area roughly half that of the United States. Of its two-hundred-odd tributaries, nearly half are navigable; but in practically all cases rapids necessitate portage by land. This is the reason why the great landlocked mineral state of Goiás still remains little explored, and why Pará, Amazonas, and Mato Grosso are sparsely inhabited and have no significant production.

The São Francisco River, broken by the Paulo Affonso Falls, one of the many "Niagaras" of Brazil, is not navigable in several long stretches between its rapids, which cause it to lose considerably in value. It, however, has not failed to play an important role as a means of access to the hinterland of the state of Bahia and northern Minas Gerais. The rush to Minas Gerais for gold and precious stones caused a substantial population movement along that route, while today cattle and cotton shipment is preponderant. Nevertheless, in both eras, the value of the route was not in the river's navigability but in the facilities for land and water travel which it offered. The other rivers of eastern and northeastern Brazil, such as the Doce and the Parnaíba, have small commercial significance, being navigable only for short distances along their lower courses.

In the third basin, the Paraná-Paraguay system, the Paraguay River is the most useful, since navigation is possible for a thousand miles from the Atlantic clear to Cuiabá, capital of the state of Mato Grosso. The manganese of this state, which reaches the United States in ever increasing quantities, is eloquent proof of the value of this river. However, it may be pointed out that it, and the others which form part of this basin, instead of flowing directly east to the Atlantic, suffer in the fact that they turn westward to the lowlands of the Paraná-Paraguay Basin, thus passing through Paraguay and the Argentine before finally reaching the ocean at the River Plate estuary.

The barriers formed by falls and rapids in most of the rivers of Brazil are a potential blessing inasmuch as they hold enormous power (more than 19,500,000 horsepower), the sixth largest in the world.

The rivers of Brazil which afford continuous navigation along a major part of their courses are in regions of dense rain forests where their value is most highly appreciated. It would be difficult to imagine the city of Manáos today in

the heart of jungle country—925 miles from the sea—without the Amazon River, or the northern Minas Gerais port of Pirapora without the São Francisco, or Corumbá without the Paraguay. River transportation still serves its purpose in the remoter regions; railway transportation tends to confine itself to the coast and some interior regions of the southeastern states. In length of railways, Brazil is ninth among the countries of the world, having more mileage than England, Japan, or Italy. From a few miles of railway in 1854, the length steadily increased, and at the turn of the century had risen to more than 9,000 miles. Today it exceeds 21,000 miles. Of this total 38 per cent is under government administration, 31 per cent is the property of the states, and another 31 per cent is owned by private or foreign companies. About 3 per cent of the total network is electrified.

The region in which more than half of the total mileage is found (the states of Minas Gerais, São Paulo, and Rio) is one of the roughest in topographical features in all Brazil. The Serra do Mar (Coast Range), literally rising out of the sea, necessitates a steep climb near the coast, as at Santos, from sea level to an altitude of approximately 2,000 feet.

Despite the extension of the lines, the rolling stock is relatively scarce, and Brazil has a record of only 6,000,000,000 ton-miles of freight a year, ranking fifteenth in the world. To some extent, the load carried is limited by varying gauges; but a greater limitation is the lack of freight cars, evidenced by the congestion of the lines in many regions.

Highway construction encounters much the same obstacles as railroad construction—rolling or steep terrain, many rivers that have to be bridged, and dense vegetation that has to be cut through in many regions. Nevertheless progress has been made, and there are now more than 200,000 miles of roads. A large part of the network is in the southeastern states, where the general progress of the region and the better organized economy favor road building. Most of

the roads are of packed dirt, although urban streets are of macadam or asphalt. The striking feature in motor transportation in Brazil is the large number of trucks in proportion to motor cars, evidence of the importance of roads in the national economy and of the lack of rail equipment.

Over the 4,950 miles of ocean front, there are innumerable anchorage points, among which more than fifty are of commercial importance today. Each economic zone has at least one major deep-draft port, while the concentration of the population along the coast line has necessitated the construction of many secondary ports for coastwise trade and the maintenance of open roadsteads to make up for the lack of railways or heavy volume highways. Estuary or river ports are common because of the dependence upon rivers for inland transportation and because of the location of cities.

There are seventeen ports, with complete port equipment, such as quays, piers, cranes, railway facilities, and warehouses. Two of these are in the Amazon valley (Manáos and Belém), six in the Northeast (Natal, Cabedelo, Recife, Maceió, São Salvador, and Ilhéos), five in the Southeast (Victoria, Rio de Janeiro, Nicteroy, Angra dos Reis, and Santos), and the rest in the South (Paranaguá, Rio Grande, Porto Alegre, and Pelotas). It must be noted that two of the ports in the south, Porto Alegre and Pelotas, are somewhat inland, situated in the Lagoa dos Patos, and do not accommodate big vessels but do take special dual-purpose coastwise ships (which, incidentally, are the most economical in the Brazilian merchant marine).

II

AGRICULTURAL AND ANIMAL PRODUCTION

BRAZILIAN history, although divided academically into chronological periods, marks itself off, practically, into economic commodity production cycles. Such turning points as the establishment of the *capitanias* (1534), the raids of the French (1558–67), the Dutch conquest in the Northeast (1630–62), the Inconfidência Mineira which was headed by Tiradentes in Minas Gerais in 1788–89, the transference of the Portuguese royal family to Brazil (1808), the independence of Brazil (1822) followed by the rule of the two emperors, the liberation of the last of the slaves in 1888 and the establishment of the republican form of government a year later, may be important. But it is often more logical to see this same development separated into the days when *páu-brasil* was the chief export, when sugar ruled the colonial economy, to be followed by mining, when coffee meant Brazil, and finally the present administration, economically denominated the diversification cycle. The Brazilian economy, until 1930, was nearly always a monoculture, and if at any time this culture was not plainly to be seen it was usually because the period was one of transition, with production collapsing and large migrations of people occurring. The latter phenomenon explains a large part of the concentration of effort on a single product where the land is exceedingly fertile, or rich in minerals, and the lack of interest in diversification of agriculture.

Brazil, some authorities say, is able to support two hundred to four hundred million inhabitants. If its density of popu-

lation equaled that of Denmark—a country of decidedly lower fertility and of limited mineral resources—Brazil would have more than seven hundred million. Today the population is under forty-three million; at the beginning of the Vargas regime it was about thirty-five million; in the first years of the rubber cycle, eighteen million; at the dawn of the coffee cycle, eight million; at the time of the mineral cycle, slightly more than one million; and at the start of the sugar cycle, about sixty thousand. The perpetual scarcity of labor on the one hand, and the great room for expansion of productive forces on the other, place Brazil at the threshold of its real development, which will come when her land, plains, forests, fertility, climate, and mineral resources are more fully developed and coordinated. The advent of the machine has aided greatly in this march forward. It has begun to divert more and more labor to manufacturing, with nearly 10 per cent of the gainfully employed now engaged in industry, which increased its output 233 per cent since 1929—the second highest rate of increase among the large nations of the world.

What then does the future hold for the country which is still running on its “first wind”? Probably the best indication would be a brief survey of the agricultural, mineral, and pastoral products which are now produced on a commercial scale, leaving to the imagination the extent to which these may be increased by the addition of more labor and machinery.

According to world standards, the “staff of life” is always one of the cereals or grains. Brazil has passed through stages in which manioc, corn, rice were the chief items. The tuber called manioc, or cassava, is native to Brazil, and both before and after Cabral, growing wild, in all parts of the country, it was the staple food of the people. Today it is still an everyday food, all twenty-one states growing manioc and preparing manioc meal or flour. However, new and more varied

uses have developed for this root, and today it is a source of alcohol, tapioca, starch, and baking flour. Of the annual production of 6,000,000 tons, the second largest in the world, most is consumed within the country, as a root, as tapioca, as a flour mixed with wheat, rice, or corn flour, as a coarse meal and in starch. Another tuber is the *inhame* (*taro*), which takes the place of the common potato in Brazil. Corn, also native to Brazil, has been for centuries one of the principal foods of the country. It is now grown in all twenty-one states. With an annual output exceeding 6,000,000 tons, Brazil is the third largest producer of corn, most of which is consumed locally. Minas Gerais is the number-one corn and hog state.

Rice, a leading tropical cereal, was not native. Nevertheless its culture has developed rapidly, and Brazil is the leading producer among the Occidental countries. It is easily grown in Brazil, and there is a huge internal demand for the grain. Of the annually increasing output, which in 1940 passed 1,500,000 tons, 99 per cent is consumed within the country. Although it is grown in all twenty-one states, consumption is much greater in the South, where it is eaten in both city and country. One of the most familiar combinations in Brazil is *feijão e arroz* (beans and rice) with beef-steak. Curiously enough, the bean also is an imported plant that is now grown in all states. In world production of beans, Brazil is third, with an output ranging from 750,000 to 900,000 tons.

Turning to the Temperate Zone cereals wheat, oats, barley, and rye, one finds the first deficiencies in agriculture. Although production is annually increasing, the supply is still insufficient for Brazil's needs, small though these are in the case of oats and rye. Wheat and barley are the serious problems: only about 15 per cent of the total apparent consumption of wheat is produced within the country, and Brazilian importation of this grain is the fifth largest in the

world. This is in striking contrast to the years prior to independence (1822), when Brazil exported to the countries from which she now imports. In no small part, this change is due to the coming of many European colonists who have popularized bread and other wheat products among all classes of Brazilians. Barley is imported on a large scale in malt, the annual amounts being approximately equivalent to the production, i.e., twelve to thirteen thousand tons.

Prospects for further development of cereals and grains and starches or tubers in Brazil are good—even of the two which may be most difficult, wheat and barley. The huge imports of these have been noted by the government, and although the solution seems far away methods of culture and selection and distribution of seed have been improved, and assistance extended to the farmer in marketing his product. Wheat enjoys the advantage of being cultivable as far north as the state of Pará. The possibilities for growing barley, however, are strictly limited, and it therefore demands even closer study. Brewers are particularly interested in the problem and have given no little thought and financial aid to the program of the government.

Since the middle of the last century, coffee has made its presence felt, not only in Brazil but in the world. Coffee, grown in fifteen states, for a long period was synonymous with Brazil. The principal producers may be narrowed down to São Paulo in first place and the three neighboring states of Rio, Minas Gerais, and Espírito Santo: these states together produce approximately two-thirds of the world total. High prices and a free hand in the world market, and the large flow of Latin European immigration, facilitated for many years the expansion of production in Brazil. Exports also increased, from the 162,000 bags a year in the 1820's to 15,000,000 bags annually at the turn of the century. Since then Spanish American competition has been keen, and exports have tended to remain at that level. The heavy de-

BRAZILIAN AGRICULTURAL PRODUCTION
(Principal Products, in 1,000 Tons)

PRODUCTS	1931-35	1936	1937	1938	1939		Value in 1,000 Contos
					1,000 Tons	1,000 Tons	
Coffee.....	1,480	1,577	1,349	1,325	1,324	1,428	2,043
Raw cotton.....	184	351	399	422	428	5404	1,521
Corn.....	5,470	5,721	5,797	5,951	5,404	1,225	778
Rice.....	1,203	1,213	1,245	1,500	1,456	1,9322	562
Sugar cane.....	16,221	18,496	15,736	16,092	19,322	6,836	555
Manioc root.....	4,974	4,946	5,218	5,817	6,836	403	403
Beans.....	719	826	844	930	785	999	342
Cottonseed.....	429	820	946	1,046	1,339	1,360	220
Oranges.....	1,066	1,325	1,405	1,493	1,104	215	215
Lumber ^a	268	379	456	493	495	495	193
Potatoes.....	363	335	328	381	381	187	187
Tobacco.....	98	90	86	90	98	134	164
Cacao.....	103	126	118	141	1,654	1,654	139
Bananas.....	1,430	1,471	1,599	1,333	1,11	119	119
Carnauba wax.....	8	10	10	9	227	201	65
Grapes.....	214	201	211	—	—	—	—
Total, including others:							
Tons (1,000).....	...	38,794	36,662	38,016	...	...	...
Contos (1,000).....	...	8,455	8,805	9,134	...	...	...

pendence upon this monoculture, and rising surpluses that could not be exported, brought on a distinct economic disturbance, which the government sought to relieve by a series of interventions in the distribution and even production of coffee. At first artificial valorization was the solution; later burning of surpluses of the cheaper grades settled the question, while still later officially controlled competition in the world market apparently cleared the surpluses. Today coffee ceases to be a problem and is instead a hope. The overproduction, the accumulation of stocks, and the cost to the government of burning or dumping in the sea brought the situation to a crisis in which an entirely different solution had to be found. The one which was adopted may be said to be representative of the general policy of the government —development of industrial uses of coffee, for oil and plastics such as cafelite, caffeine, and furfural.

Sugar belongs to a group composed of coffee, cacao, tea, and yerba maté and known as tropical foodstuffs. Sugar has passed through an infinite number of booms and crises in Brazil, where it made an auspicious start and gave its name to an economic cycle. From the position of leading sugar producer in 1580–1700, as we have said, Brazil dropped with the disruptive gold rush after 1700 to Minas Gerais and with the rise of cane sugar in the Antilles and sugar beets in Europe. In absolute quantity, however, the production has continued to be significant, and today the country is the world's second largest sugar-cane producer and the sixth largest sugar manufacturer. The crises in this commodity had always been overproduction, cane disease, and droughts. The latter two had been solved; but after 1932 the problem of surpluses worsened, and drastic measures became necessary. From the crisis was born a solution of inestimable value—the use of sugar as a source of alcohol for fuel and manufacturing, now under the control of the Instituto do Açúcar e do Alcoól (Sugar and Alcohol Agency) created in that year.

By a country which must import practically every drop of gasoline and petroleum that it uses, the value of this alcohol in a fuel mixture with gasoline can hardly be ignored.

Cacao, another of the tropical foodstuffs, is native to Brazil and is found in seven states; but 98 per cent of the output is concentrated in the one state of Bahia. Despite the limited extent of the cultivation of the chocolate bean in Brazil, the country is the second largest producer in the world. In addition to the high centralization of production, it is notable that 90 to 95 per cent is exported. Because of these facts cacao has never attracted much attention in Brazil, and its troubles pass almost unnoticed save in Bahia, where the government has established the Instituto de Cacáo, an agency that controls the production. The industry is also well organized, from grower to the ultimate consumer.

Tea production is of little significance, being about 250 tons annually. However, the fact that tea can be grown has some importance. The exportation of tea started in 1937 with 396 kilograms, and went up to 134,163 kilograms in 1941.

Yerba maté, or Brazilian tea, is a beverage prepared from the leaves of the maté tree, which is native to southwestern Brazil and Paraguay. The pulverized or ground maté leaf is used as a beverage, much like green or black tea, served hot or iced, or in the making of *chimarrão*, a drink extremely popular in the southern part of Brazil, Argentina, Uruguay, and Paraguay. It can be used in place of green tea. Of the average annual production of 100,000 tons, approximately 60,000 tons is exported, principally to the River Plate countries; a small part goes to the United States.

Guarana, a plant limited to the extreme northern part of Brazil near the Amazon River, offers another tropical foodstuff which is used particularly for beverages. Indians as far south as Paraguay make long journeys on foot to the

municipality of Maués in Amazonas in order to obtain the stimulating beverage.

Tobacco in colonial days ranked second among exports from Brazil. At present the country is the fifth world producer and exporter.

Brazil is extraordinarily rich in fruits. Practically all kinds can be grown with equal success, because of the innumerable variations in climate from humid tropical to cool temperate. Besides the more commonly known European fruits, there is a great number of native tropical fruits, some of which even Brazilians do not know. However, though the number is large, those actually used are few. Even the exportation of oranges and bananas is of recent origin. A few years ago figs and strawberries were rarely found in the markets, and were offered at prices far out of reach of the masses. Today, however, they are sold in large quantities and at low prices. This has every possibility of happening with cherries and melons, which are still imported although they can be grown in Brazil.

The consumption of fresh vegetables tends to increase with the improvement of transportation facilities. Many still remember when lettuce for the citizens of Rio de Janeiro came only from the state of São Paulo, which is more than twelve hours distant by train. Stranger yet, is the apparent paradox, quite common in Brazil, of the cities of the hinterland importing some of the vegetables that they consume from gardens around the capital of the state. This is because the rural population, accustomed to a monoculture economy, ignore the cultivation of cabbage, tomatoes, cauliflower, beets, etc.

The big state of Amazonas has practically no agriculture. In fact one of the essential features of João Alberto's plan for the development of its rubber plantations is the establishment in that region of conditions encouraging agriculture as a permanent activity. The plan includes the organization

of a university in Santarem as well as an expansion of the Instituto Agronomico already in existence.

Through the centuries, monoculture has ruled Brazilian agricultural economy. And it is strange that cotton, so well adapted to the soil and the climate, has rarely been important long. Actually, cotton has always constituted a "backlog" for the farmer, a recourse when his main product failed or seemed to decline in importance. The sugar-mill owner of the Northeast permitted his dependents to cultivate cotton only when sugar was in extreme difficulties. In the state of São Paulo, now the leading producer of Brazil, cotton was less remunerative than coffee until the 1930's, and for that reason the bulk of the production was by the northeastern states—for decades the leading cotton center of Brazil. Until São Paulo undertook large-scale scientific production in the 1930's, cotton was a backward industry also. The coffee crisis of 1929 rudely awakened the Paulista *fazendeiro* to the necessity of a sounder economy resting on cotton and fruit as well as coffee.

The immediate solution was cotton. In 1930, the country produced only 318,000 tons. The success of the plantations in São Paulo largely accounted for the rise to 1,500,000 tons at the outbreak of World War II in 1939. With this output, Brazil is now the fourth largest producer in the world. The exports also have increased heavily during the same period, from 42,000,000 pounds in 1930 to 648,000,000 pounds in 1939. The war closed the German and Japanese markets, and today Brazil ships to Canada, South Africa, Spanish America, and Britain. In this development, another interesting transition has arisen—the export of textiles has increased, taking some of the surplus of cotton caused by the loss of former markets for the raw cotton.

Cotton is the principal fiber now grown in Brazil. The country also offers admirable conditions for the cultivation on a large scale of raw silk. One may also include the poten-

tialities of synthetic fibers because of the abundance of raw material available.

By virtue of the war in the Pacific, Brazil may become one of the principal suppliers of a series of fibers now cut off from the United States. The jute of India was acclimatized with great success in the Amazon valley, which, however, suffers from a chronic scarcity of labor that keeps it from competing successfully with the other fibers, which are grown in the South, principally São Paulo. In 1942, the first large shipment of Brazilian burlap was made to the United States. It was made of a mixture of jute and guacima (a fiber which is a perfect substitute for jute and in addition is easily cultivated). Numerous others of the same type are found in Brazil, like *papóula*, caroá, manila hemp, and sisal. Of the latter, caroá has been industrialized to the highest degree, and from it are made string, rope, textiles, burlap, paper, etc. Flax is also grown in southern Brazil in fairly appreciable quantities.

With the exploitation of the babassu palm on more rational lines now, Brazil will have a new source of fibers. This palm is one of the marvels of nature, producing not only the oil from its kernel with a high content of glycerin, but also excellent fibers which have long been used by the people of the tropical region where it grows. The exploitation was on a small scale since it depended on the degree to which the nut was used. Only the first steps have been taken toward making full use of the nut. The palm flourishes in an immense belt, principally in the states of Maranhão and Piauhy in the North. The working of the forests is limited to the coastal zones at present. For some years, the babassu kernel has been exported to the United States as a substitute for copra. With the practical disappearance of the latter from the market, due to the loss of the Philippines and the Dutch East Indies, this palm should come into its own, principally in the soap and margarine industries in the United States,

which are now suffering from a lack of raw material. War industries also find in babassu a valuable substitute inasmuch as the oil can replace coconut oil in explosives. An American company, with the aid of Brazilian capital, has recently completed studies toward the exploitation of the babassu. The oil will be produced in Brazil (done until now only on a small scale) to save the shipping space which would be necessary for an equivalent number of kernels. A further step would be the extraction of the glycerin in Brazil also.

The babassu has prodigious possibilities. When Brazil begins to make full use of the nut, she will extract a number of valuable by-products, such as acetic acid, methyl alcohol, and even coke. There are difficulties in the way, as there were for oiticica oil; but they will be overcome, with the spur of war necessities. The oiticica is another native oilseed, the use of which was delayed long years. The war in China, however, menaced the supply of tung oil more and more, and a lack of this oil, of vital necessity in paints and in naval construction, meant trouble of no small proportions. Then the new oil was announced, and today the needs of industry in the United States are supplied by oiticica oil, the exportation of which increased from 1,500 tons in 1937 to 16,600 tons in 1941.

It is well known that Brazil is the world's largest producer and exporter of castor seed. The castor-oil industry, however, is still in its infancy because of legal restrictions by various countries on importation of the oil. In the United States, for example, the seed enters free of duty while the oil must bear a heavy import tariff. A temporary adjustment to the necessities of war by lowering the tariff on oil would no doubt economize much shipping space and at the same time give the oil industry in Brazil the impulse it has long been awaiting. The same may be said of the cashew nut, of which India was the leading supplier to the United States.

The oilseed resources of Brazil are enormous. Until re-

cently, the exploitation of this source of wealth was limited to the non-cultivated seeds; today, the principal oleaginous materials are cottonseed, castor seed, and linseed.

In the Amazon, conditions are favorable for the installation of a large vegetable oil and fiber industry. However, the economy of the region formerly centered upon wild rubber. Except Henry Ford, no one has succeeded in cultivating rubber on an appreciable scale in this region. The Ford plantations are still small, and it is expected that the output in 1945 will reach a maximum of 5,000 tons. The entire Amazon now furnishes about 20,000 tons of wild rubber annually, of which approximately half is needed within the country, principally in the state of São Paulo where the major rubber articles industry is located. The United States needs rubber, and signed a financial accord in 1942 with Brazil by which increased tapping of wild-rubber production is to be undertaken. From the Brazilian viewpoint, however, this increase can be realized only to the extent it does not prejudice other economic activities of the region, where the scarcity of labor has always constituted an extremely grave problem. It is true that the Amazon, in the early years of this century, produced twice as much rubber as it does today. One must bear in mind, however, that in those days every one lived by the working of rubber and the region imported all supplies, including fuel, clothing, corn, rice, and beer. Today, the inhabitants live a better life, on a balanced economy. There is nevertheless a certain interest in the renewed exploitation of native rubber, with allowance for the time when the cultivated and more economical rubber of the South Pacific returns to the American market. A new agreement, intended to promote the migration, from other Brazilian regions, to the Amazon, of nearly 50,000 men, has just been signed in Washington.

A point for special consideration in this problem is how to establish a more satisfactory economy in the Amazon

region while at the same time exploiting the possibilities of rubber to the utmost. No doubt the necessary labor will be drawn in. The complementary resources which might be exploited, and are of substantial necessity, are the gums, balsams, resins, essential oils, and tropical hardwoods and the medicinal plants. Other problems, seemingly of secondary importance, are none the less critical and must be solved before a coordinated economy can be achieved. These include prevention of malaria, opening of communications between the innumerable inland waterways, and the increase of river traffic.

There are still other products which take the name of Brazil to many corners of the world—some, almost without competition from other countries. Principal among these are the vegetable waxes. Brazil is the world's sole producer of carnauba wax, essential to polishing waxes, shoe polish, records, etc. The closest foreign substitute is candelilla wax, from Mexico, but it is still a weak competitor. More important as a substitute is the uricuri or licuri, also a monopoly of Brazil. Almost unknown until recent years, this wax was not recorded in official statistics of exports until 1937. In that year the total shipments amounted to 3 tons, while in 1941 they had risen to 2,183 tons.

With the second largest tropical forest area in the world, it is a simple matter to imagine the possibilities that exist for Brazil in the production of lumber, railroad ties of iron-wood, and rare hardwoods for fine furniture. But naturally the large forested area is not limited to one type or climate—it includes not only a tropical rain forest of exuberant vegetation where billions of trees and vines form an impenetrable mass struggling for light and life but also miles and miles of Paraná pine in an open homogeneous evergreen forest. Brazil's variety of woods is infinite, ranging from the lightest balsam to the heaviest, "ax-breaking" hardwoods. There is a wood for every purpose, from Paraná pine

building lumber to the rarest and most beautiful cabinet woods.

Astonishing variations of terrain and climatic conditions endow Brazil with an extraordinarily rich flora. For purposes of classification, its immense area may be divided into three parallel zones which run in a southwest-northeast direction roughly parallel to the east coast of Brazil—a division that corresponds notably with the phytographic division of the country, in which the Equatorial or Amazonian Region, farthest inland, has a humidity ranging from 80 to 95 per cent, the Sertão Region, next, has the low humidity of less than 80 per cent, and the Coastal Region has a humidity varying from 80 to 85 per cent.

The Equatorial or Amazonian Region includes the states of Amazonas, Pará, Territory of Acre, sections of Mato Grosso and Goiás and Maranhão. The characteristic flora is *Hyloëia* (name chosen by Humboldt for the Amazon forest). From an economic viewpoint, however, it may be noted that the upper Amazon, with its heavy rainfall, contains principally such plants as the murumurú oilseed, ivory nuts, native cacao, and guarana. Rubber is also relatively abundant, as is copaiba from which a rich balsam oil is extracted. In the lower Amazon, *hevea* (rubber) is the principal tree while in the zone which may be termed the Estuary or series of mouths of the Amazon River, no particular flora of great economic importance need be singled out due to the abundant varieties. Scattered over the whole zone is the tall majestic Brazil nut tree which bears a product universally famous. Various tropical hardwoods are found throughout the region.

A zone extremely rich in natural forest wealth is the second of these regions, the Sertão. At its northern extremity is the zone which is known as the "Cocais" (coco palm)—in reality a transition zone between the Amazon Estuary zone mentioned above and the true Sertão, which in many sections is

semiarid. In this Cocais zone is the babassu palm, which yields the valuable oilseed and a husk "of a thousand uses." In some zones, one finds the cashew, the barbatiman, and several valuable timbers (páu-pomba, favéira, candéia, etc.), while carnauba is also found in smaller quantities. The Caatinga, or arid scrub region, also in the Sertão Zone and adjacent to the Cocais Zone, is semiarid and contains the caroa and other valuable plants and fibers and also has quantities of the manioc, the oiticica (tung-oil substitute), cashew, coconut palm, and several valuable timbers. Forming part of this zone also are Campos (grass lands). In general, it may be termed a savanna and has no specific flora which is outstandingly important. The Pine Zone in the South is so called because of great numbers of Paraná pines—*Araucaria brasiliiana*. Others of some importance but of restricted growth are the *imbuia*, which is found in some sections of the state of São Paulo, and the yerba maté of the South and some parts of the state of Mato Grosso. A small southern zone known as Campinas (meadows) is, in type, affiliated with the pampas of Argentina and has no flora of economic significance except grass, which is excellent for grazing.

The Coastal Region which extends along the Atlantic seaboard from Cape São Roque in the state of Rio Grande do Norte to the southern part of the state of Rio Grande do Sul consists of the forest formed by the ample rains of the coast. Centuries ago, this coastal forest was a continuous belt one hundred miles wide parallel to the sea, but the growth of population and the resultant burning and clearing of the woods have greatly reduced the forested area. Nevertheless it still includes some valuable woods, such as ipê, cedar, páu-brasil, jatobá, and peroba. Along the coast the palm is also of considerable importance, while in the higher lands some of the plants are of economic value. The only maritime vegetation of economic value is the mangrove, from which small quantities of tanning extract are produced.

When Cabral discovered Brazil, there were no domesticated animals although the Indians were very fond of pet birds, monkeys, and parrots. Cattle, horses, goats, sheep, and poultry were practically unknown, and according to Pero Vaz Caminha, the first historian of Brazil, when two Indians were shown a sheep and a chicken, they were dumfounded: they had known only *caetetus*, capybaras, deer, elk, armadillos, and jaguars. Thus, practically all the domesticated animals were imported; today, the country has more cattle than people and ranks fourth in the world in cattle; in the number of horses and swine also it is fourth, while in mules it is third, in goats eighth, and in sheep fourteenth.

In the early days, the value of animals depended on their usefulness as draft animals and, after slaughtering, on their hides. Gradually, salted and dried meat became important. Scarcity of salt was at times a national problem because of the great dependence on salted meat and the value of hides. From the period of salted and dried meats alone, plateau Brazil gradually developed a dairy industry and, not long after, began building packing houses. Carrying this development still further, Brazil began exporting prepared leather (soles and uppers), which continues today along with frozen meats and by-products.

Few improvements were made in livestock in colonial days, or even in the early decades of the republic. The first serious effort to improve livestock was made in the 1920's and '30's. Then new species were imported and breeds were crossed to create a strictly Brazilian type adapted to the climate and conditions of the country. Large areas of grazing land and the prolific growth of grass have always been favorable factors along with climate. Diseases and pests are subject to control and do not present very grave problems. The most serious difficulty is transportation of the product.

In beef and veal production Brazil ranks fourth or fifth in the world. São Paulo and Rio Grande do Sul, with their

better pastures and numerous packing houses, lead the country, producing more than half of the annual total of 800,000 to 900,000 tons. Minas Gerais and Estado do Rio are of less importance in meat although Minas is a great livestock state. The canned-meat industry is now the third largest in the world.

Until a decade ago, hogs were slaughtered for their lard; pork and the by-products were insignificant. Today, the pork and the by-products have grown to a first-class industry, in which Brazil ranks eighth in the world, with its exports finding an increasingly large market overseas. It is to be recalled that Brazil is third in corn production; and the state of Minas Gerais is the largest corn and pork producer in Brazil. Pork production ranges from 275,000 to 300,000 tons annually. Lard output is approximately 130,000 tons per year.

The strong Brazilian aversion to lamb, mutton, and goat meat defies plausible explanation. In the world production Brazil is twenty-second; the annual output of mutton averages 7,000 tons, and that of goat meat 5,000 to 6,000 tons.

Starting from scratch in the sixteenth century, meat has come to be one of the largest among the so-called "processed products." Being worth more than 2,000,000 contos (\$100,000,000), meat production is valued at 500,000 contos more than coffee.

The dairy industry concentrated on cheese in the early days because it could be transported long distances without spoiling. Various local types of cheese were developed in colonial times, especially in Minas Gerais, which is still the leading state. Immigrants introduced some of the cheeses of Mediterranean countries in Brazil, and today the output of cheese amounts to 42,000 tons. Recently butter production has grown from an annual output of about 20,000 tons in 1920 to 42,000 tons in 1939. Lack of uniform statistics makes it exceedingly difficult to ascertain the output of milk in

Brazil. However, an estimate of 850,000,000 gallons annually is reasonably safe. The condensed-milk industry is relatively new and has an output of only 6,000 tons, while powdered milk is still of little significance with an annual output of 700 tons. Casein, an important milk by-product for the plastics and fibers industry, is unimportant in Brazil principally because of a lack of knowledge of its possibilities.

As was mentioned, the hides industry was the most important of the early animal products industries. Hides are still fairly important, and in the export trade, Brazil holds second place. A worthy complement to the hides industry is that of skins. It may be noted that Brazilian kid leather is universally recognized for its quality and is shipped in large quantities to the United States. In addition, the abundant fauna provide varied and numerous skins of high commercial value, particularly alligator skin, fish leather, wild boar, jaguar, etc.

Cattle breeding in Brazil, as we have seen, is almost as old as the country itself. The original cattle were introduced in the Captaincy of São Vicente by Martin Affonso de Souza, in 1530. Later many stud animals were brought to Bahia from Cape Verde and Portugal: bull, cows, horses, asses, mares, sheep, and goats. From São Vicente and Bahia cattle spread to other parts of Brazil. Originally the cattle were used mostly as draft animals.

The cattle brought from Europe penetrated deeply into the Brazilian hinterland. With the development of the sugar industry in Pernambuco and Bahia the São Francisco River valley in the interior was gradually settled, and to it were brought all kinds of herds. Little by little, cattle ranching spread to the interior of these two provinces as well as to the entire Northeast. On the banks of the São Francisco the Casa da Torre was founded. This became the greatest cattle farm in Brazil, and at one time comprised 600 square miles of grazing land. On the other hand, the cattle originally

brought to São Vicente formed the nucleus of the herds in the center and south of the country. From herds originally taken from Santa Catarina to Paraguay came the cattle later brought to Rio Grande do Sul around 1634, to start the cattle industry there. The discovery of gold attracted large numbers of people to the central regions, and the Pioneers (*bandeirantes*) and miners took cattle herds along with them. From Bahia many herds were taken by way of the São Francisco valley to Minas Gerais. The conquerors drove their cattle over mountains and through rivers and forests, across Brazil, fabulous distances.

The location of the cattle industry in the interior was an historical necessity. Cattle ranches required vast pastures and cheap land, with sparse population. Agricultural activities on the coast had increased the value of the land and brought a denser population. The road to the west was therefore the natural one. It is estimated that the cattle trade was more of a gamble than a business, so many were the risks involved. For a long time, only the hides were exploited, and as stated above these constituted the only important item in the newly born cattle industry of Brazil. At the beginning of the eighteenth century in the whole country there were not more than 1,500,000 head, and Brazil exported to Europe yearly 110,000 hides. A hundred years later Rio Grande do Sul alone sold 400,000 hides. It is estimated that the hide exports from Brazil during the colonial period brought in a total of £15,000,000.

Owing to superiority of the grazing land, the South and Southeast of Brazil always have enjoyed preference for cattle raising. Thus, nowadays, the animal products industry in the country, including cattle and factories, is concentrated in the states of Rio Grande do Sul, Minas Gerais, Santa Catarina, Paraná, Rio de Janeiro, and São Paulo, and in the central state of Mato Grosso.

III

THE MINING INDUSTRY

AN OLD legend aptly depicts the mineral situation of Brazil. According to the story, God scattered the available minerals in various parts of the world, favoring some with quality, others with quantity, and still others with variety. What was left over of each, he stored in the interior of Brazil far from the reach of the many exploiters who might pass along the seacoast, placing a wall of steep and high mountains along the coast as added protection and leaving only one difficult way of approach: the Rio Doce valley. This realistic legend bluntly states the problems and the possibilities of mutual benefit to the United States and Brazil which lie in the mineral industry.

Brazil has so many kinds of minerals that it is much simpler to enumerate those which she lacks than those which she has. Her mineral wealth must, however, be developed with tools, equipment, and technicians. Iron, chromite, beryllium, manganese, and bauxite ores are already filling gaps in hemisphere supply. Tungsten, copper, nickel, and the base-metal ores are awaiting their turn. Among the non-metallic minerals are mica, rock crystal, and the precious and semiprecious stones, like industrial diamonds. There are also pyrites, talc, diatomite, and magnesite. A complete survey of little known or small deposits further increases the variety. What the large unprospected regions of Brazil hold is still in the realm of conjecture.

Mining until this century was largely confined to three products: gold, diamonds, and to a decidedly lesser degree

iron. During the most active years of the so-called Mineral Cycle of 1695–1760, large quantities of gold left the country. These shipments were equivalent to 50 per cent of all the gold produced in the world in the last three centuries and equaled the entire production of America from 1493 to 1850. The average output in those days was about fourteen tons annually; today it averages ten tons. With the depletion of the alluvial gold and diamonds after 1770, there came a period of stagnation in the mineral industry, and Minas Gerais reverted to a more sedentary life. Thus, for a period, iron and limestone were the only minerals exploited on an appreciable scale, principally to feed the local forges and smithies and to supply lime and building material.

A new mineral age began with the coming of the industrial revolution and the needs which it created overseas. Although new deposits of nickel, tungsten, mica, and chromite were discovered at the turn of the century, they were worked sporadically, and only became important in the national economy during the First World War, when they were shipped overseas in appreciable quantities. Since the early 1930's, a new interest in the minerals of the country has developed with the impulse given to industry as a whole by the self-sufficiency program of the present Administration. The mineral exports in 1928–1930 included monazite, zircon sand, ilmenite, lime, coal, rock crystal, graphite, manganese, marble, mica, lead, chromite, iron, agates, carbonadoes, diamonds, and salt, all averaging slightly more than 200,000 tons. Today one finds in addition, asbestos, kaolin, slate, marble, beryllium, talc, aquamarines, amethysts, garnets, topazes, tourmalines, bauxite, copper, rutile, columbite, tantalite, tungsten, and colored earths amounting to five to six hundred thousand tons. Between 1939 and 1941 the Brazilian exports of minerals increased from 637,786 tons to 1,017,756 tons. Supplementing the above production, it must be noted that, in the former period, few if any minerals were

MINERALS EXPORTED FROM BRAZIL

PRODUCT	1939		1940		1941	
	Tons	Contos	Tons	Contos	Tons	Contos
Diamonds (kilos).....	41	39,457	51	81,403	64	147,915
Rock crystal.....	678	19,096	1,103	27,863	1,980	98,797
Manganese ore.....	189,003	20,640	222,713	32,311	437,402	80,374
Iron ore.....	396,938	18,903	255,548	16,185	420,756	30,811
Iron (bars, etc.).....	...	...	3,882	4,453	15,691	25,048
Mica.....	435	7,890	1,117	15,756	867	23,845
Pig iron.....	23,413	8,739	22,147	11,321	34,946	20,846
Aquamarine (kilos).....	380	1,663	1,169	13,469	525	11,255
Coal.....	500	475	6,900	819	61,434	7,414
Iron (rolled, etc.).....	...	...	4,539	4,798	4,795	6,685
Total, including others.....	637,786	125,931	523,528	221,813	1,017,756	487,803

mined strictly for domestic consumption; today, tin, nickel, pyrites, arsenic, saltpeter, petroleum, molybdenum, diatomite, barite, apatite, feldspar, gypsite, and asphalt are produced in modest or large quantities which do not leave surpluses for export and thus do not appear in the enumeration.

Among the metallic minerals iron is preeminently first. With a reserve estimated at fifteen billion tons, one-third of which contains 50 per cent or more metal, Brazil ranks first among the countries with iron-ore reserves, possessing as she does about 22 per cent of the world's total. Moreover, Brazilian ore has the further advantages of concentration in location and practicability of mining may be carried out by the open-cut method of mining, which is economical in operating costs. In 1940 the output of the state of Minas Gerais, practically the only producer, was 740,000 tons, as compared with 339,000 tons in 1937. The zone of the largest deposits is located in Minas Gerais some three hundred miles from the ports of Victoria in the state of Espírito Santo (through the above-mentioned legendary outlet, the Rio Doce valley) and Rio de Janeiro. Besides the zone in Minas Gerais, which extends from Itatiaiuçú to Pico Belo Horizonte, with more than 3,200,000,000 tons of iron, and the Itambé and Morro do Pilar deposits with 3,000,000,000 tons, there are those of Santa Rita Durão, Pitanguí, São Vicente and São Gonçalo, Burnier and Ouro Preto, Mutuca and Morro Grande, and Morro Agudo and Monlevade with more than 1,000,000,000 tons each. Unknown quantities also exist in the states of São Paulo, Paraná, Santa Catarina, Rio Grande do Sul, Bahia, Goiás, Mato Grosso, and Ceará—those of the first five being magnetite in general, while those of the latter three are principally hematite like that in the state of Minas Gerais.

Brazilian exports of iron ore averaged 36,700 tons annually during the 1920-29 decade and fell to 4,400 tons in 1930-34. The average in 1935-39, however, rose sharply to 221,900

tons a year. In 1940 exports amounted to 225,548 tons, but in 1941 the total was 420,756 tons, the highest ever attained in our export history.

Manganese, of which Brazil is the fifth largest producer and exporter, is worked in the states of Minas Gerais, Bahia, Paraná, and Mato Grosso. In 1940, of the total of 313,400 tons the output of the state of Minas Gerais was estimated at 304,900 tons, that of Bahia at 7,600 tons, and that of Paraná at 900 tons. Although it is known that Mato Grosso produces and exports manganese from its vast reserves, the quantity is unknown. In Minas Gerais the leading deposits are of the Burnier and Lafayette types. In general, the former mineral contains 54 per cent manganese while the latter, which is the chief ore worked at present, has about 51 per cent. In the Jacobina district of Bahia the ore averages 53 per cent metal, while in Urucum in the state of Mato Grosso it falls to about 44 per cent. Export ore, in general, ranges from 45 to 48 per cent. The principal mines, although often worked in open cuts, have now passed to the gallery system. Exports of manganese have tended to increase, in general, being more than 437,400 tons in 1941, the highest for two decades.

Four zones yield chromite in Brazil, a mineral of which Brazil is the second largest exporter in the Americas. Of the three chromite areas in the state of Bahia, that which centers about Campo Formoso, about 328 miles from the port of São Salvador in the same state, is the largest, having a calculated reserve of 4,000,000 tons with 36 per cent chromite oxide although it is possible to concentrate on ores of about 50 per cent. Mining is carried out in open cuts. The second zone, that of Santa Luzia, is approximately 160 miles from São Salvador and has about 100,000 tons of ore with 36 to 42 per cent chrome oxide. The third, the Boa Vista deposit, contains from 30 to 36 per cent chromium oxide in a reserve with a minimum of 20,000 tons. The ore of Piauí

in the state of Minas Gerais, the fourth zone, has a 34 to 47 per cent content, but in comparison to the Bahia deposits may be said to be relatively small. Recent exports of chrome ore have been as follows: 1937, 850 tons; 1938, 934 tons; 1939, 3,554 tons; 1940, 4,572 tons; and 1941, 4,424 tons.

Among the alloy metals for which Brazil is well known is nickel, the deposits of the Livramento and Ipanema districts in the state of Minas Gerais and the São José de Tocantins region of the adjacent state of Goiaz being the most important. Some minor deposits occur in other parts of Minas Gerais and Areal in Estado do Rio. The mineral of Liberdade has a metal content which approximates 2 per cent while that of Livramento has a minimum of 2.5 per cent. According to the latest available data, the Aiuruoca deposit in southern Minas Gerais produced 5,000 tons of ore while the Ipanema reserves yielded 4,100 tons. Of all reserves, however, the one with the greatest promise is in Goiaz. Incomparably superior to those of Livramento and with a metal content which varies between that of New Caledonia and Canada, the Goiaz reserve, estimated at 2,000,000 tons, is one of the most important in Brazil.

Another ore which shares the limelight as an essential alloy metal is beryllium, of which Brazil has important sources. The beryllium oxide content of the ore varies slightly but averages about 12 per cent. It is possible to supply ore for export with a content of as much as 14 per cent—a rather high mineral content in trade. The principal Brazilian deposits are in northeastern Minas Gerais, southern Bahia, and the Rio Grande do Norte districts of Jardim de Seridó, Parelhas, Carnaúbas, and Acarí. Exports in recent years have risen abruptly, testifying to beryllium's industrial value. In 1938 the total export was 203 tons; in 1939, 276; in 1940, over 1,472; and in 1941, 1,703.

Tungsten is another alloy metal found in Brazil. It is encountered in liberal amounts in the stolzite of Mariana in

Minas Gerais and in the wolframite of the state of Rio Grande do Sul. The former contains 51 per cent of tungstite, and the latter, which is the only ore worked at present, averages 53 per cent. Exports of the ore showed a sudden jump from less than a dozen tons a year in 1937-40 to 32,400 tons in 1941.

Surveys to date show anything from small occurrences to fairly large reserves of the ores of antimony, arsenic, bauxite, bismuth, cadmium, cobalt, columbite, tantalite, copper, gold, lead, mercury, molybdenum, platinum, radioactive minerals, tin, titanium, vanadium, and zirconium. Most valuable of these are the bauxite of Minas Gerais and Maranhão; the alluvial and deep-mined gold found throughout Brazil; the tantalite and columbite in the states of Rio Grande do Norte, Parahiba, and Minas Gerais; the tin of Rio Grande do Sul, Minas Gerais, Bahia, Rio Grande do Norte and Paraíba; the copper of Rio Grande do Sul; the nickel of Goiás; and the lead of Paraná and São Paulo.

It is a strange coincidence that among the nonmetallic minerals of Brazil—asbestos, barite, diatomite, feldspar, fluorspar, graphite, kaolin, mica, nitrates, phosphates, monazite, diamonds, carbonadoes, emeralds, corundum, pyrites, rock crystal, salt, semiprecious stones, talc, asphalt, gypsum, lime, magnesite, marble and ochers, etc.—those which are the most developed in addition to salt are “strategic” minerals such as mica, industrial diamonds and carbonadoes, and rock crystal.

Brazil is, in normal times, the fifth largest producer and exporter of mica—a mineral so common in parts of Minas Gerais and Estado do Rio that it glitters in the roads. The principal deposits of Estado do Rio are in Campos, São Fidelis, and Paquequer, the last of which has some plates which are six feet thick. In the state of Minas Gerais, more than twenty districts have worked this mineral at one time or another. Latest production figures for Minas Gerais place

the annual output in excess of 1,200 tons. Other states which have deposits of some significance are Goiaz and Bahia. Exports in recent years have been approximating half of the total output of the state of Minas Gerais, and increased from 236 tons in 1936 to 867 tons in 1941.

The mining of diamonds in Brazil is practically limited to the working of alluvial gravels in Minas Gerais, Bahia, Mato Grosso, Goiaz, Amazonas, and Paraná. Some well known parts of Minas Gerais are Diamantina, Abaeté, São José da Chapada, Coromandel, Estrela do Sul, Grao Mogol, and Serra do Cabral. In Mato Grosso, one of the newer diamond producing states, the principal mining is carried out along the Rio das Garças and in the Cosim zone of the Rio Juruema and its tributaries. Another relatively important source is the Rio Aquidauna. Most of the diamonds of the state of Goiaz are found in the Veríssimo district and the alluvial gravels of the Corumbá, Caiapó, and Araguáia rivers. The exports of diamonds in 1941 amounted to 321,545 carats as compared to the 254,330 carats of 1940 and 215,000 carats of 1939. A characteristic feature of the trade in industrial diamonds and that of carbonadoes, i.e., black diamonds, is that the former have steadily been increasing at the expense of the latter. A partial explanation of this trend is found in the advantage of the small diamonds over the carbonado for industrial uses. Carbonadoes, however, continue to be worked, principally in the Piranhas district of the state of Bahia, the only carbonado producing section in Brazil—or, for that matter, in the world. In 1941, exports of carbonadoes totaled 21,540 carats, against 11,520 carats in 1940.

With rising demands for rock crystal in radiotelegraphy, television, and the optical industries, Brazilian exports of this stone have increased annually, reaching the highest yet recorded in Brazil with a total in 1941 of 1,979 metric tons. Lesser producers and exporters of rock crystal are

Madagascar, Japan, Kenya, and Southwest Africa (rose quartz). Brazil is the leader, and Minas Gerais, the principal producing state, has deposits scattered throughout, the most significant in present output being Diamantina, Curvelo, Sete Lagôas, Buenópolis, Montes Claros, Bocaiuva, Grão Mogol, and Itanhomi. In the state of Bahia the deposits are in the vicinity of Conquista. The state of Goiás has quartz of high quality and for this reason has been exporting some in recent years, the principal producing sections being Cristalina and Santana.

The Government, long recognizing the value of the coal of Rio Grande do Sul and seeing it being used to advantage in various industries, took steps to increase the use of national coal and peat in Brazil. In 1932, a law was passed requiring the use of a certain percentage of Brazilian coal in some industries, principally transportation. Thus from the 285,148 tons of 1930, gradual increases resulted in Brazilian output. In 1941 the total was 1,408,048 tons. Imports of coal in these years were 1,745,000 tons and 1,057,946 tons respectively; therefore national production in 1941 surpassed imports. The "Gaucho State" accounts for 76 per cent of the coal mined; but Santa Catarina also has increased its production since 1930, Paraná has produced coal since 1938, and São Paulo since 1940.

With a fabulous known mineral wealth, Brazil might be expected to have a large mineral production; actually, however, until about 1935 few minerals were exported, while most had only a small domestic market. Restricted output continued despite relatively large imports of some of the same minerals in refined form. Since the early 1930's, drastic measures have been taken by the Government to bring about Brazilian self-sufficiency in minerals and in metallurgy. One of the earliest measures was to draw up a new Code of Mines as well as one on water-power development, regulating the whole field along more nationalistic and rational lines. Fol-

lowing this, government attention focused on certain minerals including coal: one-fifth of the total consumed by certain railroad lines must be of national origin. Petroleum received attention, and persistent exploration and drilling finally resulted in the development of the fields of Bahia and the discovery of oil in the Territory of Acre, the western-most part of Brazil, purchased from Peru and Bolivia in 1903 and 1909. Salt production is now regulated by the Government to guard against abrupt changes in the industry. Agencies are also planned to normalize trade in precious and semiprecious stones.

In order to relieve the congestion of land transportation facilities in Minas Gerais, São Paulo, and the Federal District, a new outlet for Minas Gerais' huge iron-ore exports has been established at Victoria in the state of Espírito Santo. The Administration's efforts to develop the phosphate (apatite) deposits of Ipanema in São Paulo, and the lead deposits in the same state at Ribeiro de Iguape and in the state of Paraná, have been crowned with success. In the latter two, the Government took a direct interest by installing the refining and concentration equipment, while in the case of the bauxite of Ouro Preto and other districts of Minas Gerais its aid is through financial support of the erection of one aluminum reduction plant. The installation of the \$45,000,000 steel plant at Volta Redonda to overcome the iron and steel difficulties of today may be cited as another example of direct government aid. The gold purchasing policy of the Banco do Brasil is often pointed out as the sole cause of the huge increase in production in recent years. The classification and fiscalization of minerals constitutes a step directed more toward the standardization of all Brazilian export products but will no doubt profoundly affect domestic trade also. Several states have established, or are planning, mine schools. (The oldest and largest school of mines in Brazil was established at Ouro Preto in 1876,

now the national faculty of geology and mineralogy.) It must also be pointed out that the central laboratory of the Departamento Nacional da Produção Mineral (Bureau of Mines) is also gradually extending its activities into the important mining centers in order that field analyses may be made on a larger scale.

Government aid is also extended in many indirect ways; for instance, by exempting or reducing import duties on industrial machinery. Another way is by encouraging refined mineral imports—useful in building up the transformation industry of manufactures. That this has been successful is proved by the general increase in the output of factories which use minerals as a raw material.

Superficially, it would appear that a sudden shift from a policy of self-sufficiency to one of Pan-American coordination, which the nation heartily supports, entails serious adjustment within the country. The regulation of certain minerals so as to favor the local industry would apparently work against the mutually desired inter-American policy. However, a close comparison of the types of minerals which must be exported to the United States and those which Brazil must process and retain for her own metallurgical and other industries with the inter-American and self-sufficiency programs reveals that there is little if any conflict of interest, and that it is actually of mutual advantage that mineral exports be increased to the maximum, both commercially and strategically. The program had thus, knowingly or unknowingly, been operating so as to help Brazil not only stabilize her economy but also organize her industry that it would make less demand upon other New World sources of vital strategic minerals.

What then are the principal steps which must be taken to increase this mutually beneficial movement of minerals? Let us look at the problem, first, on the geographical side. The old legend about the hiding behind mountains of

Brazil's minerals stresses one of the principal obstacles which must be overcome. Iron, manganese, chromite, tungsten, beryllium, mica, rock crystals, diamonds, nickel, etc., are concentrated in the central plateau, which is separated from the Atlantic by steep ranges of mountains. Thus the routes to the sea are limited to a few highways and railroads. Over these the minerals must compete for freight space with the heavy year-around agricultural and pastoral production of a subtropical country. That the rolling stock must be increased is generally accepted.

The new triangular agreement between Brazil, Great Britain, and the United States by which the Brazilian Government acquired control of the Victoria a Minas railroad is bound to change the picture entirely. Already \$14,000,000 is being spent to improve the railroad and dock facilities and those at the Itabira mine itself.

Port facilities present comparatively few difficulties, the principal need being a more rational system of warehousing and allotment of shipping space. With the completion of the iron-ore export docks at Victoria (state of Espírito Santo), much will have been accomplished toward insuring a heavier flow of this mineral to the United States, Great Britain and Canada.

In the interior, mining itself gives little trouble inasmuch as most of it is done by open cuts. Doubtless more large steam shovels and loading machines would aid considerably, but the truck and railway hauling situation is much more serious.

Another serious aspect of the problem is ocean shipping. With the need of utilizing all available space to the limit, it is plain that the ores must be concentrated and refined as far as possible before shipment. In Brazil, abundant water power is available; but equipment is lacking, as is evident from the fact that little ore of any kind is brought in, imports being in metallic form. The benefits to be derived from

a Brazilian refining and metallurgical industry can hardly be underestimated.

The degree to which Brazil may be fitted into a coordinated Pan-American mineral industry is thus principally a question of how Brazil's present volume can be increased.

IV

A FEW COMPARISONS BETWEEN THE DEVELOPMENT OF THE UNITED STATES AND THAT OF BRAZIL

AN ANALYSIS of the resources and conditions of Brazil leads to but one conclusion: very few countries in the world are better prepared to maintain an industry of their own, both basic and of transformation. The casual observer will certainly be surprised that the industrialization of Brazil has gone so slowly; but this slow progress is due to various reasons easy enough to understand.

The rivers of Brazil are great indeed; but often, instead of flowing toward the sea, they head toward the interior, and always they are interrupted by waterfalls. Moreover, the hinterland is separated from the coast by mountain ranges, which make transportation most difficult. Laying a railroad in Brazil is very costly, since countless bridges and tunnels are necessary, unless the natural obstacles are avoided; and this adds to the mileage and brings about higher freight rates. Thus a new railway is a serious problem economically and commercially.

The coal and iron deposits of Brazil are far apart, and the ores easiest to exploit are nowhere near the sources of fuel: this explains why Minas Gerais, which contains approximately 16 per cent of the iron-ore deposits in the whole world, has to use charcoal to make steel. In Rio Grande do Sul, which has most of the important coal deposits, there is some iron ore; but whether it can be exploited profitably is still doubtful. The two states are more than a thousand miles apart.

For centuries Brazil has depended on imported fuel, but the situation has improved in the last few years. Coal from the southern deposits of Brazil supplies more than half the domestic consumption. In normal times about 15 per cent of the gasoline used in the country has been a mixture including anhydrous alcohol from sugar cane. This occasionally reached 60 per cent, with the probability that it will be stabilized around 30 per cent from now on. In 1920 the electric power production did not exceed 354,900 kilowatts; in 1940 it reached 1,186,882 kilowatts, 85 per cent being hydroelectric; but even this represents only about 7 per cent of the hydraulic potential of Brazil.

The development of Brazil began about the same time as that of the United States, but their progress has been dissimilar. European immigrants always showed a preference for the United States, not only because its climate is similar to that of their countries, but also because circumstances indicated a quick industrial development: rivers that flowed to the sea, coal associated with the iron deposits, and absence of mountain ranges between the coast and the hinterland. Between 1821 and 1924 the United States received 33,000,000 immigrants; in the same period, Brazil received fewer than 4,000,000.

Another circumstance which greatly favored the development of the United States was the discovery of gold in California in 1849, and the famous rush which had so much to do with the expansion of the United States to the Pacific. The country was comparatively small when it began to be actively settled, and when industrialization started. After 1845 about two million square miles were annexed to its territory, whereas Brazil has been a country of three million square miles since the seventeenth century—in other words Brazil has always had the problem of great distances overwhelming man. The North American had time enough to organize his little house before he even began to expand the

frontiers of his country, and already there was a considerable nucleus of civilization within the comparatively small territory, with a population large enough for the settled area. Whereas in 1810 the United States had a population of 7,239,891, the population of Brazil was less than 4,000,000 as late as 1823. Just when the problem of crossing the desert was being met, the news of gold discoveries in California brought a great incentive for further pioneering; and the North American suddenly found himself on the Pacific, with the Far East and its possibilities before him. The Oriental countries had just been opened to the Western powers, through the overwhelming capitulations imposed upon China and through Commodore Perry's visit to Japan. So it happened that, when the gold age came to an end, those pioneers were able to maintain themselves with the assistance of the Eastern trade and the active exploitation of the California soil, which was extraordinarily rich.

In Brazil the circumstances were quite different. The scarce population, limited on one side by the ocean and on the other by the mountains, also started expanding westward; but there were not as many people as in the United States around the nineteenth century and the principal means of living was the exploitation of tropical products and their exportation. It is noteworthy that as far back as the seventeenth century Brazil's exports of sugar alone totaled £3,000,000, a figure higher than the total export of England herself. The climax of penetration into the interior of Brazil took place in the eighteenth century after the discoveries of gold and diamonds; but, once the mines were given up as exhausted, the people in the hinterland were forced to return to the coast. At the end of their penetration, instead of facing an ocean and the possibility of trading with rich lands overseas, the Brazilians faced the Andes, gigantic, almost unsurmountable, and inhabited by extremely

poor Indians, colonized by Spain which at that time was an enemy of their mother country Portugal.

Just as previously there had been a gold rush in California, the beginning of the twentieth century witnessed a similar phenomenon on the Amazon basin, where rubber was becoming a source of enormous fortunes and attracted adventurers and enterprising men from all over the world. There took place then a tremendous impact against the jungle, an invasion of that most mysterious of all jungles, with its savage Indians and its rudimentary transportation by tiny river steamers or canoes. In this pioneering feat the Brazilians penetrated thousands and thousands of miles of dense forests, and thus created the first great center of rubber supply in the world. But they had to stop when they reached the Andean mountains, barring the way to the Pacific, a few miles beyond. The same happened to the populations of the countries on the western side of South America,—Colombia, Peru, Bolivia, etc.,—which were unable to pioneer eastward from the Pacific. Of the rubber age there remains, in the very heart of the fantastic Amazon jungle, the city of Manáos, quite important and still one of the most modern cities of the country.

The "March to the West" started centuries ago and was then interrupted to enable the country to organize itself both economically and demographically, as has been described. Recently the Government has adopted the phrase as representative of one of its policies. Among other works ordered by the Administration one deserves special reference here—the construction, now under way, of the Brazil-Bolivia Railroad, which will give a much desired outlet to the Atlantic for Bolivian products. Bolivia, isolated in the center of South America, without any seaport, will then find a way of exporting the petroleum of which it has so much, and which is needed in Brazil. It is today very plain to the Brazilians that their future lies in the interior, in those

far-away and huge areas where a plane may fly for hours and hours without seeing a single house, man, ox, or mule. They are not barren, inhospitable areas, as one might be led to infer. What they lack is population, people to work and think out their problems, and solve them. And yet it should be mentioned that Brazil alone has about 46 per cent of the total population of South America.

The importance of the airplane in the settlement of Brazil should not be underestimated. In 1929 the total length of the lines in operation was 3,600 miles, while in 1941 it reached the considerable figure of 55,000 miles—the tendency and obvious necessity of Brazil has been to use this most rapid system of transportation. Notwithstanding this improvement, the airplane travel is still very expensive in Brazil, where each kilometer flown in a commercial air liner costs the passenger 900 reis as against 100 reis by train. The reason for this is that only recently has an airplane motor factory been put under construction in the country, and even so, independence in fuel supply has not yet been achieved. In this respect, as in many others, Brazil has entirely different problems from those of the United States.

There have always been very good reasons why the two most important nations of the Western Hemisphere should develop differently. Whereas, in the early colonial period of the United States, wheat, barley, oats, hay, iron, steel, coal, and lumber—all existent also in Europe, the only possible outside market—were produced for internal consumption, Brazil had to struggle with the lack of fuels and had to import steel and iron. Of course Brazilian soil is quite suitable for such essential cereals as wheat, barley, oats, and hay; but the plateau where such crops could profitably be raised is separated by mountain ranges from the settled areas of the country. However paradoxical it may seem, it was Brazil's misfortune in every instance to have been able to concentrate on a single product which offered great possibili-

ties in foreign markets. What happened to the whole of Brazil, up to a short time ago, occurred also in the South of the United States, where the dependence on cotton was an important obstacle to development and industrialization.

In order to find a market for the colony's sugar production, Portugal was compelled to accept a treaty imposed by England at the beginning of the nineteenth century, in which it was stipulated that British goods imported into Brazil would not be subject to a higher customs duty than 15 per cent *ad valorem*. As a consequence of this treaty Brazil was soon importing from England woolen materials, hats, boots, earthenware, cheese, butter, mirrors, silk, ladies' dresses, and cotton piece goods, besides (in smaller quantities) hams, preserved tongues, smoked lard, cooking oils, wines, iron goods, salt, matches, brass, gunpowder, and pharmaceutical products. Brazil imported from the United States such articles as wheat flour, turpentine, furniture, and tar. Brazil exported at that time gold, diamonds, precious stones, sugar, raw cotton, hides, tobacco, brandy, vegetable waxes, indigo, and hardwoods. The importance of Brazil to British trade is shown by the fact that in 1812 it absorbed British goods in a proportion 25 per cent larger than Asia. In fact its imports from England amounted to as much as 50 per cent of the total imports by the United States from the same source. Three-fourths of the total imports were manufactured cotton goods.

In 1808, after Napoleon's occupation of Lisbon, the Portuguese King and his court moved to Brazil. In 1815 Brazil was raised to the dignity of a Kingdom, and in 1822 it became independent. Portugal refused to recognize its independence; and, while this was so, Great Britain was bound by its treaty with Portugal not to recognize the sovereignty of Brazil. The treaty which guaranteed British supremacy in the foreign trade of Brazil expiring in 1825, the Lisbon Government sent to Rio de Janeiro Sir Charles Stuart, an

English diplomat who soon after arriving reached an agreement whereby Portugal recognized the independence of Brazil. The Court of St. James's recognized Brazilian independence on January 30, 1826, by receiving a Minister Plenipotentiary from Emperor Dom Pedro I.

The British Government succeeded in reaching an agreement with Brazil similar to that existent before independence, whereby the tariff on English goods imported into Brazil was limited to 15 per cent *ad valorem*. The new treaty expired in 1844, and it may well be said that the real independence of Brazil was established on November 9, 1844, when the Ministry of Foreign Affairs at Rio de Janeiro announced that the trade agreement with England was no longer in effect.

Around 1850 Brazil experienced a revolution in its economy. After a period of internal political struggles all power was centralized in the hands of Dom Pedro II, who ruled over the nation for forty-nine years, and whose only great trial was a war with Paraguay which lasted five years (1865 to 1869). This Emperor is known in Brazilian history as Pedro the Magnanimous. His reign saw a general betterment of the financial situation of Brazil, with the increase of internal revenue, abolishment of budgetary deficits, and the adoption of new protectionist tariffs. In twenty years the Customs revenues in Brazil doubled, and the credit of the country abroad was firmly established. It was also during his rule, as early as 1850-1860, that coffee began to represent 45 per cent of the total exports of the country.

Coffee rapidly became the predominant factor in the international trade of Brazil, reaching a position of absolute supremacy, with exportation steadily increasing. It was the golden age. Foreign countries constantly made loans to maintain Brazil's exchange rate at a high level and keep the coffee prices up. The rich landowners of the state of São Paulo, where most of the large coffee plantations are, to-

gether with their neighbors of Minas Gerais, dominated the national politics, while the Northeast, which had been rich through its sugar, steadily lost in importance. On the Amazon the rubber period was dawning, but it was not destined ever to dethrone King Coffee. In those times consumption goods formed the bulk of Brazilian imports, whereas imports of production goods were still a very secondary part in the national economy. Those, obviously, were symptoms of a typically colonial structure. In 1874-1875 cotton manufactures and semimanufactures led the list of imports; beverages were second; wool, both raw and manufactured, was third; *xarque* (jerked beef), fourth; linen manufactures, fifth; wheat flour, sixth; gold and silver, seventh; coal, eighth; iron and steel, ninth; and hides and skins, tenth. Machinery, apparatus, and instruments, as we have noted, came sixteenth, following dairy products, perfumery, silk manufactures, chemical products, and roots, tubers, and plants, and followed by codfish and paper and its manufactures.

In the meantime the population was increasing, and the first European immigrants were settling in São Paulo and the other southern states, Santa Catarina, Paraná, and Rio Grande do Sul. In the last, the cattle industry was growing in importance, and exports consisted of leather and jerked beef, whereas imports of consumption goods tended to increase. The landowning class was firmly opposed to the establishment of manufacturing enterprises, believing that they would seek to obtain protective tariffs, which would cause other countries to restrict their imports of coffee and other tropical products from Brazil. The landowners advocated free exchange.

The enterprising Baron de Mauá was the first to envisage the great future that awaited Brazil in the development of industry. His influence was most beneficial, bringing about the first serious step toward a broader economical con-

ception in Brazil, which was then dependent entirely on agriculture and a semifeudal, slavocratic mode of living. Thanks to Mauá, a new way of thinking arose among the governing circles which was to be strengthened by experience throughout the country: men began to believe that the great national problem consisted much less of exporting than of producing for domestic consumption—which increased the need for better transportation facilities. As such ideas came more and more to be accepted, a new tariff was established on all kinds of imports except live plants, seeds, roots, agricultural implements, and industrial machinery—which entered Brazilian ports free. The new tariff rate, applying equally to all other products, was 40 per cent *ad valorem*.

In 1888 slavery in Brazil was pacifically abolished, and European immigration had an extraordinary increase. The immigrants brought Brazil a good inheritance. Some became great captains of industry, and they or their descendants control today a good part of the modern industrial organization, having played a part in creating some of the first canneries, factories for shoes, earthenware, hats, and glassware, cotton, silk, and wool mills, and metallurgical and chemical plants.

Notwithstanding these advances, coffee remained predominant; and the élite continued, to a degree, to look down on manufacturing, considering it as a field for laborers and immigrants. Mauá himself, who built the first railroad in Brazil, died a bankrupt.

Brazil always has been an exception in Latin America. It was the only country colonized by Portugal and is, therefore, the only country speaking Portuguese. In its history it is separate from all the other Latin American countries. To a Brazilian child, Bolívar is as little known as George Washington. Continental heroes who contributed to the independence of other South American countries—for in-

stance, San Martín, who exerted an influence on Chile, Peru, and Argentina—have no significance to the ordinary Brazilian.

In 1808, when Mexico, Venezuela, Argentina, and Ecuador were still Spanish colonies, Brazil became the seat of the throne of Portugal. The whole Portuguese Court was transferred to Brazil, bringing to Brazilian society an aristocratic and conservative character which later became strengthened during almost a century of the Empire. Brazilian Independence, in 1822, was not accomplished through revolution. Simply, the Crown Prince of Portugal, who had stayed in Brazil when his father returned to Portugal, thought that he should attend to the suggestions of his Brazilian Ministers, and they believed that the time had arrived for Brazil to declare its independence. It was as if the Prince of Wales had been designated to govern Ireland and, when in Dublin, had granted independence to the Irish, making himself ruler in a new kingdom. From 1822 to 1930, there was no victorious revolutionary movement in Brazil whatsoever. The Empire had a Parliament organized after the English tradition and was constitutional in an ample sense, which prevented the appearance of *caudillos* and gave to Brazil a different aspect from the riotous Spanish American countries of that epoch.

Titles of nobility were not hereditary in Brazil. During almost half a century of rule, Dom Pedro II conferred titles on the great statesmen and wealthy farmers, the latter generally becoming barons: coffee barons, sugar barons, cattle barons, tobacco barons. Among these barons of agriculture Mauá stood out as a baron of industry.

Such an aristocracy, rooted in the economy, society, and politics of Brazil, was almost unassailable by the immigrant who had to make a fresh start. In Brazil of that epoch, where manufactures hardly existed, an immigrant could subsist only by commerce or agriculture; and the former

was regarded as degrading while the latter was undervalued because of the existence of slavery.

The Republic was to eliminate the titles of nobility, and elevate others—that of doctor, for instance: this title is awarded in Brazil on graduation from a university, as physician, engineer, lawyer, or dentist. The immigrants' children became doctors. They succeeded in industry, politics, letters, law, and medicine. Consequently, some of them even became accepted by the traditional families of Brazil. In spite of this, the social structure of the Republic, from 1889 to 1930, retained its basis in the semifuedal economy of coffee; and the old families kept the key positions in government.

In 1930, other enlightened elements of political dominance, headed by Getulio Vargas, came to realize that it was propitious to create a new organization for Brazil. Most celebrated is the remark of one of the statesmen who forged the revolution together with Vargas. "Let us make a revolution before the people may make it." Oswaldo Aranha declared: "Brazil is a desert of men and ideas."

Getulio Vargas was the Governor of Rio Grande do Sul—politically one of the strongest states but economically backward, in part because of the lack of interest on the part of the Federal Government whose whole attention was given to coffee. Antonio Carlos, Governor of Minas Gerais, the state with the largest number of electors, supported Getulio Vargas. The other twenty states, except Parahiba in the Northeast, supported the Federal Government. The presidential elections at the beginning of 1930 showed the Governor of the State of São Paulo as the winner, supported by the President of the Republic. In view of the many frauds disclosed, the electoral result was questioned. Shaken by the biggest crisis in its history with the drastic fall of coffee prices, the country plunged into a political disturbance from which sprang the revolution beginning October 3 and ending October 24, 1930. True to tradition the army and

navy sided with the Federal Government, recognizing the revolutionary government when this took office.

On the heels of the revolution of 1930 came a deep economic, political, and social transformation of the country. New elements were adopted, the principal preoccupation being the integration of labor into the new organization through the measures of protection, such as the law of vacation, minimum wage, the eight-hour day, retirement, and protection for the family. Today, Brazil boasts one of the most advanced systems of labor legislation in the world. Note that even in 1929 the Brazilian Government serenely stated that the social question in Brazil was simply a matter of police.

FOREIGN TRADE OF BRAZIL

YEARS	EXPORTS		IMPORTS	
	1,000 Metric Tons	1,000 Contos	1,000 Metric Tons	1,000 Contos
1932	1,632	2,536	3,254	1,518
1933	1,911	2,820	3,837	3,165
1934	2,185	3,459	3,845	2,502
1935	2,761	4,104	4,229	3,855
1936	3,109	4,895	4,467	4,268
1937	3,296	5,092	5,099	5,314
1938	3,934	5,096	4,913	5,195
1939	4,182	5,615	4,788	4,983
1940	3,236	4,960	4,336	4,964
1941	3,535	6,729	4,049	5,514

Although the industrialization of Brazil has been given, since 1930, an impulse that allows us to consider this year as the starting point of a new phase of the national economy, we do not wish to close without mentioning that the World War of 1914-1918 opened new horizons for the Brazilian industry, as it brought about a complete disorganization of the coffee trade and proved, moreover, that a good manu-

facture is more profitable than monoculture. The country, overnight, faced a very serious problem; namely, the shortage of innumerable commodities some of which could be easily manufactured domestically. New textile plants were built everywhere, while the existing factories were expanded and modernized. The existence of a good industrial set-up was becoming, thus, of vital importance to the country, and many agriculturists showed a growing interest in the industrial field in view of the profits it was yielding under the protective tariff. And yet, the traditional policy of coffee protection at the expense of other national interests and of the industrial development was in effect as late as 1930, when, as we said, President Getulio Vargas took over the Government. A tremendous depression was sweeping the whole world, and coffee was one of its chief victims. The demand for this product dropped considerably, and the enormous production caused thousands upon thousands of bags to be piled up in the large warehouses. The comparatively high prices, artificially maintained by Government subsidies with the help of repeated loans in the London and New York financial markets, had to give way sooner or later; this happened before the Brazilians even dreamed of a by-product which would one day offer the greatest hope for definite improvement in the coffee situation—cafelite.

The state of São Paulo, the center of coffee growing, where many of the immigrants had settled, had enough foresight to diversify its agricultural activities and its industry, with an eye to supplying the needs of Brazilian consumers. All over the country new plants were erected to satisfy domestic consumption as much as possible, since the drop in Brazilian exports had impaired the country's credit and borrowing powers. Previously the large volume of exports had always given the country the exchange needed to pay for imports; but now Brazil had to replace imported

articles with articles made at home. This shows why the index number of industrial production of Brazil is among the highest in the whole world. The specialized publications of the League of Nations covering the years from 1929 to 1938 give only one country, the Soviet Union, an index number higher than that of Brazil. If the production of 1929 is taken as 100, in the above mentioned period the industrial production of Russia in 1939 reached 470, whereas that of Brazil reached 330, Japan 173, Chile 136, Germany 126, England 115, and the Netherlands 104. The remaining nations, including the United States, Belgium, and France, in 1938 registered on the other hand an industrial production lower than that of 1929.

No doubt Brazil possesses all that is required to make a great manufacturing power. For one thing it has already left behind the age of indecision, and nobody today questions that the resources of a country are only made valuable when they are fully taken advantage of, whether they are mineral, animal, or vegetable. It is, therefore, widely recognized that a sufficient industrial organization alone, built upon solid foundations, can lift Brazil to the place it deserves and is destined to attain. In the development of Brazil education will play an important part. For centuries our education has been academic, the sciences being regarded as inferior. In 1930 there were more superior schools than now, the majority of them law schools. Engineering and chemical students were few, and the professional schools badly equipped. President Vargas soon realized the weakness of such a situation, and he declared: "In the period of evolution in which we are, an intellectual culture without a clear and definite object should be considered as a luxury attainable only by few individuals and of little value to the collectivity." He asserted further: "After a period of fifty years of liberalism we have not advanced much beyond edu-

cational aims which correspond to other times and to another society."

The reorganization of chemical and engineering instruction has been effected recently; numerous professional schools have been created, and those already in existence have been enlarged. Now, Brazil has more students in professional schools than France and Holland, which are highly industrial countries. Finally, we must not forget that the installation of the iron works in Volta Redonda will attract North American technical men to Brazil. The authorities are already making arrangements for these men to give practical courses so as to prepare the future Brazilian technicians. At the same time Brazil is sending a great number of students to the United States for special training.

PART THREE

PRINCIPAL MANUFACTURING INDUSTRIES

I

SURVEY OF THE MANUFACTURING INDUSTRY

1. GENERAL SURVEY

UNTIL 1844 manufacturing was practically impossible in Brazil, because of a commercial treaty with England, made at the time the country became independent, which limited the Brazilian duty on English manufactures to 15 per cent.

This treaty expired in 1844. However, within a few years the Brazilian economy became so centered on coffee that the Government and the conservative classes had no interest at all in industrial enterprises. Brazil became a great commercial country, producing almost exclusively crude materials and foodstuffs, coffee, cacao, maté, hides and skins, rubber, and tobacco.

Like the South of the United States, where agriculture based on slave holding achieved a position so dominant that that part of the country was unable to keep pace with the North in its industrial development, Brazil made small progress with industry in the years that followed. In 1889, a year after the abolition of slavery, came the Republic, with a new program of protective tariffs. Less than twenty years after the proclamation of the Republic, Brazil had already made real progress in its manufacturing industry, as revealed by a survey made in 1907. The war of 1914–1918, as we shall see later, effected a change in the economic structure of the country through advance in industrial production. In 1920 industry had already become important. However, during the subsequent ten years, it had to suffer the competition

MANUFACTURING IN BRAZIL
Distribution of Production by Industry According to Value

INDUSTRY	1920		1938	
	1,000 Contos	Per Cent	1,000 Contos	Per Cent
Foodstuffs.....	1,303.5	40.7	6,897.6	34.4
Spinning, weaving.....	806.5	25.2	4,627.7	23.1
Clothing, table and bed linen.....	261.1	8.1	1,786.7	8.9
Chemicals.....	191.2	5.9	1,520.2	7.6
Iron, steel, metallurgy.....	107.1	3.3	1,48.0	5.7
Wooden products and furniture.....	164.9	5.1	897.1	4.4
Mining and refining.....	^a	..	701.9	3.5
Glass, ceramics, building materials.....	81.6	2.5	630.0	3.1
Paper and printing.....	37.4	1.1	517.5	2.5
Machinery, apparatus, instruments.....	^b	..	334.4	1.6
Cigars, cigarettes, etc.....	106.7	3.3	315.5	1.5
Leather (except footwear).....	73.8	2.3	266.2	1.3
Rolling stock, vehicles, naval construction.....	38.8	1.2	211.7	1.0
Toys, games, musical instruments.....	1.0	0.0	69.6	0.3
Brushes, brooms, mats, other fibrous articles.....	5.4	0.1	47.6	0.2
Rubber manufactures.....	3.4	0.1	40.9	0.2
TOTAL (including others).....	3,200.0	100.0	20,013.4	100.0

Note: ^a The Industrial Census for 1920 did not include the classification "mining and refining," because of the small development of this industry. There was no manufacture of iron, steel, or cement, for instance; and the extraction of manganese, gold, coal, marble, asphalt, limestone, rock crystals, and precious stones was of insignificant volume.
^b The machinery, apparatus, and instruments industry was so unimportant in 1920 that the Census put it under "metallurgy."

of crude materials and foodstuffs which were bringing exceptionally high prices in foreign countries, prices which began to decline in 1929. From 669,000 contos in 1907, the value of manufacturing production in Brazil increased to 3,200,000 contos in 1920 and 20,000,000 contos in 1938.

Despite the rapid progress made lately by heavy industry and chemical products, the food and textile industries continue to lead in the industrial life of Brazil, representing together, in 1938, about 57 per cent of the value of total production. In 1920, they represented about 66 per cent. Between 1938 and 1940 Brazilian industrial production registered an increase of no less than 25 per cent—the value in the country reached at least 25,000,000 contos, according to reliable estimates; the production of the foodstuffs industry grew, during the same period, by 23 per cent; and textiles, 23 per cent. This progress is explained by the great demand in England and the United States for canned products (principally canned meats) and in other parts of Latin America for cotton textiles (their usual sources of supply being shut off with the war).

The production of rubber goods increased between 1938 and 1940 by 151 per cent; paper and graphic arts, 48 per cent; potteries and construction materials, 41 per cent; iron and steel, 39 per cent. It is estimated that wood and furniture production increased by 27 per cent, and chemicals and related products by 24 per cent.

It is evident that the tendency of Brazil is to vary industrial production. This variation is made within a pattern of concentration of production in determined centers. Let us see how the industrial production is distributed today in comparison with the geographical distribution ten years ago.

In 1938 São Paulo held about 43 per cent of the industrial production, while the Federal District (Rio de Janeiro City), ranking second producing center, in the same year, accounted for 14 per cent. The Federal District led in 1907

DISTRIBUTION OF INDUSTRIAL PRODUCTION BY STATES

STATE	1907		1920		1938	
	1,000 Contos	Per Cent	1,000 Contos	Per Cent	1,000 Contos	Per Cent
Amazonas.....	13.9	2.0	5.9	0.1	39.6	0.2
Pará.....	18.2	2.7	36.4	1.1	154.7	0.7
Maranhão.....	4.9	0.7	22.9	0.7	72.4	0.3
Piauhy.....	1.0	0.1	8.1	0.2	37.4	0.1
Ceará.....	2.9	0.4	25.9	0.8	186.0	0.9
Rio Grande do Norte.....	1.1	0.1	20.5	0.6	87.2	0.4
Parahiba.....	3.3	0.4	35.9	1.1	172.8	0.8
Pernambuco.....	27.2	4.0	217.5	6.8	841.6	4.2
Alagoas.....	7.1	1.0	53.5	1.6	156.3	0.7
Sergipe.....	4.2	0.6	38.9	1.2	125.3	0.6
Bahia.....	21.8	3.2	90.7	2.8	350.9	1.7
Esprito Santo.....	0.5	0.1	23.5	0.7	48.1	0.2
Rio de Janeiro.....	45.1	6.7	236.8	7.4	1,006.2	5.0
Federal District.....	221.6	33.1	666.2	20.8	2,847.3	14.2
São Paulo.....	110.7	16.5	1,008.9	31.5	8,645.2	43.2
Paraná.....	33.0	4.9	102.3	3.2	363.9	1.8
Santa Catarina.....	13.7	2.0	60.6	1.9	372.9	1.8
Rio Grande do Sul.....	99.7	14.9	353.7	11.0	2,144.4	10.7
Minas Gerais.....	32.3	4.8	178.8	5.5	2,277.3	11.3
Mato Grosso.....	3.7	0.5	7.2	0.2	45.3	0.2
Goiaz.....	1.8	0.2	4.9	0.1	37.5	0.2
Total.....	668.8	100.0	3,200.0	100.0	20,013.4	100.0

with 33 per cent, but dropped in 1920 to 21 per cent, while São Paulo, in the same period, increased from 16 to 31 per cent.

The accompanying table reveals that in 1938 about 89 per cent of the industrial production of Brazil was concentrated in six federated units, of which five, representing 85 per cent, were in the Center and South of the country. The only exception of importance to this geographical distinction was Pernambuco, in the Northeast, with a participation of 4 per cent. No Northern state participated in 1938, even to the extent of 1 per cent. It is interesting to note that in 1907, when rubber guaranteed the prosperity of Amazonia, Amazonas and Pará together controlled almost 5 per cent of the industrial production of the country. In 1938, their percentages were 0.2 per cent and 0.7 per cent respectively. Production in Pernambuco itself decreased. In 1920 this was almost 7 per cent of the total, in 1938 it dropped to 4.2 per cent. While Pernambuco was suffering this decline, Minas Gerais registered progress, from 5.6 per cent in 1920 to 11.3 per cent in 1938; this is explained by the advance made in the metallurgical industry. Rio Grande do Sul, where foodstuffs and woolen manufacture have gone ahead, ranked fourth among the states in 1938, with almost 11 per cent.

With regard to production, it must be noted that statistics on products free from the national consumption tax are difficult to obtain. The exemption of some products from this tax by the government accounts in great part for the noticeable increase in their output. The policy has been, however, to increase the number of articles subject to taxation: in 1914, only fourteen classes of industrial products were taxed; in 1939, the number was thirty-one, and in 1940, forty-three.

Statistics on the taxed classes of products, which are readily obtainable, represent only 40 to 50 per cent of the total

industrial production. For this reason the statistical comments that follow are based on the industrial censuses of 1907, 1920, and 1938. On the other hand the production subject to the consumption tax, fluctuating from year to year, indicates the trend of the national industry. The textile, thread, rope, button, butter, lard, paper, stove, metal article, toy, and bathroom fixture industries showed substantial progress in output from 1929 to 1939—all being favored with tax rates of less than 3 per cent, and the last with a rate of only 0.3 per cent. This goes to prove the point noted above, that the industries which were relatively lightly taxed showed greater progress than those which did not enjoy this advantageous factor.

It must be emphasized, however, that the Government aids industry not only by its internal tax policy but also through the protective tariff, which is used to favor the establishment and growths of vital industries.

2. FACTORIES, WORKER DISTRIBUTION, INDUSTRIES, AND WAGES

In 1907 there were 2,988 industrial enterprises in Brazil, employing 136,420 workers; in 1920 there were 13,336, with 275,512 workers; and in 1940 there were 70,026, with 1,412,432 workers.

In 1940 the distribution of workers among the principal industries was as follows: textile, 22 per cent; building construction, 15 per cent; foodstuffs, 13 per cent; iron and steel, 10 per cent; clothing, 8 per cent; chemicals, 7 per cent; potteries and construction materials, 5 per cent; tobacco, 4 per cent; wood and furniture, 3 per cent. In that year the workers were distributed about the country as follows: São Paulo, 41 per cent; Federal District, 17 per cent; Minas Gerais, 7 per cent; Pernambuco, 6 per cent; Rio Grande do Sul, 6 per cent, and Estado do Rio, 5 per cent.

Wages are still very low; but the Government is doing

everything possible to increase them, paying particular attention to a higher acquisitive capacity for the deeper layers of the population. In 1938, for example, a survey of almost a million industrial workers revealed that the wages then paid were insufficient to provide normal necessities: 22.5 per cent of the workers earned less than 100 milreis per month; 36.3 per cent earned from 100 to 200 milreis; 21.4 per cent earned from 200 to 300 milreis; 10.5 per cent earned from 300 to 400 milreis.

The situation caused the Government much concern, and President Vargas defied the conservative elements of the country, establishing minimum wages for all workers, whether industrial or agricultural. In some sections of the country, the minimum wage was not necessary, since the scarcity of labor required for industrial production and the scarcity of immigrants, had resulted in a higher standard of wages.

The six minimum wages for the several regions of the country are temporary, and subject to change in accordance with economic conditions. They were determined by the normal cost of living of the average worker. On the basis of the 1938 survey, a distribution by percentage was made of the total wages, with allowance for immediate and necessary expenses. In the Federal District, for example, the minimum monthly wage was fixed at 240 milreis, investigation having revealed a medium salary of 202 milreis. It was admitted that, in the city of Rio de Janeiro, where the minimum wage is the highest, a worker requires a minimum of 240 milreis monthly for necessities.

In a general way the minimum wage fixed by the Government varies from one state to another, and there is a marked difference in some cases. The minimum wages fixed for the state capitals vary from 120 to 240 milreis, 150 milreis being the minimum wage most frequently used. Away from the capitals the minimum varies from 90 to 200 milreis.

3. DEVELOPING THE DOMESTIC MARKET

As mentioned previously, Brazil in 1907 had an industrial production with a value of 669,000 contos. A survey of the industrial activities of the country made in that year, the centenary of the opening of Brazilian ports to international commerce, revealed that, of thirty important articles, more than three-fourths were produced in Brazil.

Six years later, Brazil still depended upon foreign supplies for its principal manufactures. The country imported about 30 per cent of the cotton textiles that it consumed; 60 per cent of the woolen textiles; 10 per cent of the prepared leather and soles; 85 per cent of the silk textiles; 35 per cent of the pottery, dishes, and glasses; 30 per cent of the jerked beef; 25 per cent of the vinegar; 50 per cent of the cheeses and butter; 65 per cent of the perfume.

These figures give an idea of the extent to which the war in Europe disorganized the economy of the country, which furthermore did not produce iron or steel, coal or cement. Pandiá Calógeras, Minister of Finance, asserted in his report of 1916:

“From the evil, an immense evil, that is the war, there arose for us a wonderful consequence. I refer to the fact that the paralysis of the importation of certain raw materials has acted as a spur to national production. New combinations are being discovered under the pressure of necessity. Substitutes are being discovered for substances which were formerly considered incapable of substitution. There are being developed or initiated the planting and exploitation of utilities which were formerly received from abroad. And the advance made is such that we may expect that, even with the celebration of peace and the demobilization of industries and ocean navigation, we shall be able to continue a manufacturing and agricultural activity larger than that prior to the outbreak of hostilities.”

PRINCIPAL FINISHED MANUFACTURES EXPORTED BY BRAZIL

Commodity	1939			1940			1941		
	Metric Tons	Contos	Metric Tons	Contos	Metric Tons	Contos	Metric Tons	Contos	Metric Tons
Cotton piece goods.....	1,981	29,387	3,958	67,904	9,237	208,649			
Woolen piece goods.....	1	18	15	1,232	189	14,827			
Box shocks.....	...	...	12,211	7,836	15,448	11,171			
Silk piece goods.....	...	...	1	317	14	5,288			
Iron tubes.....	...	...	26	41	3,369	4,259			
Pencils.....	12	261	73	1,779	181	3,955			
Burlap.....	42	78	12	77	453	3,499			
Mosaic and tiles.....	...	...	622	1,444	1,480	3,332			
Alkaloids.....	...	...	...	...	9	2,711			
Wire (iron and steel)	...	...	...	...	1,419	2,658			
Bags of jute.....	3,565	2,966	4,146	2,066	325	2,570			
Blood meal.....	...	30	4	209	4,088	2,540			
Hats.....	...	...	235	1,352	38	2,440			
Electrical appliances.....	...	...	44	729	330	2,407			
Costume jewelry.....	...	...	...	...	81	1,968			
Total of 12 manufactures.....	5,601	32,740	21,347	85,886	36,661	272,274			
Other manufactures.....	10,450	14,812	7,557	43,912	12,181	96,813			
All manufactures.....	16,051	47,552	28,904	129,798	48,842	369,087			

The war of 1914-18 forced Brazil to great efforts since the usual sources of supply of manufactures were cut off overnight. It was necessary to accelerate production within the country of manufactures which until then had been imported. A few statistics will show this trend:

Lacking a highly developed metallurgical industry, Brazil exported large quantities of scrap metal—14,000 tons in 1915, 785 tons in 1917, and 32 tons in 1918. Today, the exportation of scrap metal is prohibited in order to guarantee the necessary supplies of raw material to the domestic metallurgical industries. Until 1914, Germany was the sole exporter of dyes; and with the war her shipments ceased. It then became necessary for Brazil to turn to the vegetable dyes—of which there are numbers, such as indigo, campeachy wood, *páu-brasil* (Brazil wood), and urucú—for its needs. Today, Brazil is the only country in South America with an aniline dye factory.

As explained in the Introduction, the foreign commerce of Brazil has suffered great changes in the present war, with manufactured foodstuffs, semimanufactures, and manufactures gaining in importance, in contrast to crude materials and crude foodstuffs. A similar phenomenon occurred during the war of 1914-18. In 1913, manufactured foodstuffs, semimanufactures, and finished manufactures represented only 0.3 per cent of the total exports. In 1915 they represented 3 per cent; in 1916, 6 per cent; in 1917, 16 per cent; and in 1918, 29 per cent. In 1919 they fell back to 12 per cent. After that, the reorganization of European and North American industries eliminated Brazil as a supplier of manufactured articles, and the country returned to its classic position as a supplier of raw materials and foodstuffs.

In 1941, as stated previously, about 27 per cent of Brazilian exports consisted of manufactured foodstuffs, semi-manufactures, and finished manufactures. Of the products exported in 1918, about 90 per cent were composed of manu-

factured foodstuffs (meats, sugar, flour); in 1941 manufactured foodstuffs were only 43 per cent, semimanufactures were 36 per cent and finished manufactures 20 per cent.

Another comparison of the export of manufactured foodstuffs, semimanufactures, and finished manufactures during the 1913-19 period and the 1939-41 period shows that in 1913 there were 37 kinds of articles exported, in 1919 there were 63. In 1940, 322 kinds were shipped abroad; in 1941, 457—253 being finished manufactures.

Brazilian industry has made great progress since 1914-18. On the cessation of hostilities in 1919-20, Brazilian exports of manufactured foodstuffs, semimanufactures, and manufactures declined, and shipments of raw materials and foodstuffs increased. In 1920 seven of the principal raw materials and foodstuffs represented, together, 72 per cent of Brazilian exports; in 1927 they represented 91 per cent. It is true that in the decade 1901-10 they represented 95 per cent; in 1911-20, 82 per cent, and in 1921-30, 87 per cent. In 1931, with the world in a complete economic crisis, the prices of raw materials and foodstuffs suffered a catastrophic fall. In 1928 a ton of the above mentioned products sold for an average price of £76. The price dropped in 1931 to £30, and in 1934 to £24. Exports not being remunerative, Brazil was unable to import.

The difficulty which the importers had in obtaining foreign exchange brought about the establishment in Brazil of important branches of foreign factories. Large Brazilian firms, disappointed by the turn of agriculture and the pastoral industry, invested their capital in manufacturing. In the North and Northeast new products appeared, such as caroa, oiticica, uricuri, and timbo, while carnauba production rose to new heights. The country began to export shelled Brazil nuts in preference to the unshelled product. The exportation of minerals, which had been declining since the war of 1914-18 (during which, as was noted, its ship-

ments had increased extraordinarily), showed a new spurt which encompassed even gold. By making it compulsory that national coal should be mixed with the imported the Government lifted the coal industry of the South out of the stagnation into which it had fallen. The national consumption of salt was now wholly supplied by the salt works of Rio Grande do Norte and Estado do Rio. The founding of the Sugar and Alcohol Institute settled, once for all, the question of the prices of sugar, while at the same time, it secured a market of unlimited extent for anhydrous alcohol. The large cotton output of São Paulo increased the available supplies of cotton linter, a product which is highly quoted in the foreign markets. The Government exempted from custom duties one of the largest factories in the world producing rayon by the nitrocellulose process, thus liberating the explosives and weaving industries from dependence on foreign supplies. The iron industry, although based on charcoal, has developed rapidly.

With regard to electricity, in 1900 Brazil had an installed capacity of 10,556 kilowatts, the hydroelectric plants having only 38 per cent of the total. In 1920 the capacity increased to 354,900 kilowatts, of which 77 per cent was hydroelectric. In 1940, with a capacity of 1,186,882 kilowatts, the thermoelectric plants based on coal and oil accounted for only 16 per cent of the total, the share of the hydroelectric works being 84 per cent. It must further be emphasized that in 1920 Brazil practically did not produce coal, and in consequence was compelled to import all the fuel used. This is not true since the development of industry in Rio Grande do Sul. At least one-fourth of the thermoelectric energy is now generated with national coal.

The existing facilities for the production of electricity are of course under enormous stress. New developments and expansions to supply the increased demand have been under way for some time, but difficulties in getting the required

materials from the United States have retarded their completion. Among these are the Lage expansion project in the city of Rio de Janeiro, the Cubatão expansion project in São Paulo, the Macabu project in the state of Rio de Janeiro and the Avanhandava project in the interior of São Paulo.

From 1930 onward the import trade underwent great changes. At present, the tendency is to import raw materials, transforming them into manufactured goods in Brazil. Purchases of consumer goods from abroad have been reduced, to the advantage of goods intended for production. This carries out the policy of President Getulio Vargas, "importation of machinery to make machines."

In 1938, the year of the Industrial Census, the industrial production as we have said was estimated at 20,000,000 contos. Industry had developed far enough to be able to satisfy the greater part of the needs of consumers. Statistics confirm this point. In 1907 the industrial production was 669,000 contos; exports, 861,000 contos, and imports, 645,000 contos—which means that the foreign trade exceeded production by 125 per cent. In 1920, when the production amounted to 3,200,000 contos, Brazil exported 1,752,000 contos and imported 2,091,000 contos. In other words, the foreign trade exceeded the industrial production by only 20 per cent in 1920. In 1938 the Industrial Census revealed a production of 20,000,000 contos. In that year Brazil exported 5,196,000 contos and imported 5,097,000 contos; the industrial production exceeded the foreign trade by 49 per cent. For the year 1940 it is estimated that the excess of production over the foreign trade was at least 60 per cent.

In 1920, the agricultural and livestock industries production attained 7,935,000 contos as compared to the total of 3,200,000 contos of the industrial production which signifies that the former exceeded the latter by 60 per cent in value. The reorganization of the economy of the industrial countries of Europe not only brought about a greater influx

of foreign manufactured goods into Brazil, but also stimulated a more lively interest in agriculture and pastoral industry as was mentioned and in this way worked to the detriment of the domestic manufacturing. In confirmation of this fact, it may be pointed out that when the Department of Economic and Financial Statistics of the Ministry of Finance made an inquiry in 1927 in order to estimate the total industrial production, including that which is not taxed, it obtained a total of only 7,000,000 contos. In the same year the output of agriculture and pastoral industry was estimated by the Ministry of Agriculture at about 11,800,000 contos, which shows the superiority of the latter to be 68 per cent. In 1938, the value of the agricultural and pastoral industry production rose to only 12,800,000 contos and thus was 60 per cent below that of the industrial production of that year.

The national manufacturing industry, as has been noted, was supported by protective tariffs, its greatest expansion taking place during recent years. It was exactly in these years, however, that the protectionism had the least influence, which proves that the national industry is already resting on solid foundations. While the percentage of the custom duties on the value of imports was more than 40 in 1910, it dropped to a little more than 13 in 1920, rising from that time onward, slowly, until it reached 39 in 1933. From the latter year to the present, a period which marks the beginning of the greatest industrial expansion, the import duties have decreased in amount, dropping to 20 per cent in 1938, and 19 per cent in 1940.

4. INDUSTRIAL INVESTMENT

For centuries England dominated the foreign commerce of Brazil. With the passing of this domination, however, British capital began to be invested in the country, to the

great benefit to Brazil. In 1901 British capital investments in Brazil, chiefly railways, was estimated at £30,000,000. Gas and light, port and river projects, the submarine cable, sewerage systems, navigation and streetcar companies are among the enterprises which we owe to British capital. In 1913 about 30 per cent of the deposits in Brazilian banks belonged to British banking institutions. It may be noted that in 1913 foreign banks controlled 45 per cent of the banking deposits in the country, while in 1940 they controlled only 14 per cent. The decrease was due to improvement in the national banking facilities.

The war of 1914-18 lessened the influence of British capital in Brazil and paved the way for a large increase in North American investments in the country. The increase in United States investments found its way to industry. This explains the predominance of North American capital to-day over other foreign capital in Brazilian industry. There is a tendency in the United States to participate more largely in the industrial development of Brazil. In 1936 the distribution of United States investments in Brazil was as follows: manufacturing, \$50,183,000; commerce, \$15,612,000; petroleum, \$32,678,000; public utilities, \$84,411,000; other enterprises, \$11,461,000—in all, \$194,345,000. Adding the amount of the external debt, we find that the amount of United States capital invested in Brazil is more than \$500,000,000.

Naturally, however, the principal contribution to the industrialization of Brazil has been made by Brazilians themselves. A recent survey in the state of São Paulo, which contains 43 per cent of the manufacturing, revealed that at least 70 per cent of the capital invested in industry in that state is Brazilian. Canadian capital is important, controlling electric power services.

The contribution of the immigrants should also be mentioned. The cigar industry in Bahia, a traditional industry

in the country, is conducted by the descendants of Germans; also the beer industry in São Paulo and Rio de Janeiro. In Rio Grande do Sul and Santa Catarina, where an industrial boom is on, many factories are controlled by Germans or by Brazilians of Teutonic descent. There are numerous industrial establishments in Rio de Janeiro City founded and maintained by Portuguese or descendants of Portuguese. Witness São Paulo with its many captains of industry, where Germans, Syrians, Japanese, Hungarians, Dutch, Spaniards, Swiss, and French, even though outnumbered, compete with Italians.

Granted the great contribution made by the immigrants, the part played by the Brazilians themselves remains the most interesting side of the industrial development of Brazil. Not so many years ago, the old families that dared to invest their capital in industrial activities were few; the general preference was agriculture or cattle. Which was understandable in people who had lived by these for centuries.

5. THE PROTECTIVE TARIFFS

From the time of colonization, the only industry in Brazil was that of artisans. More important still, a rural handicraft almost feudal. In agriculture and cattle raising, the land-grant system predominated, with transportation limited to muleback and oxcart. The *latifundiário* (large landowner) had to provide himself with everything and bought as little as possible. The rich farmers of São Paulo and Minas Gerais adopted the maxim, "In this house are bought only iron, salt, gunpowder, and lead." All other articles needed were produced at home. Under these conditions industrial enterprise had no chance.

Brazil, however, changed completely. Cities, which were relegated to the background by the predominance of farms and ranches, ended by gathering the elite. For instance, the

city of São Paulo, which had only 65,000 inhabitants in 1890, has 1,300,000 now. In growth it can be compared only with Los Angeles. São Paulo, the largest industrial center of Brazil, increased twentyfold in population in fifty years and is now eighth city in the Western Hemisphere. A great part of this transformation is due to the immigrants who settled in the cities and prospered through the creation of industries. The countryside could go no further than the growing of raw materials. It was natural for the farmers and ranchers to join with the immigrants in order to share the profit from industrialization.

In the beginning Brazilian industry maintained itself only with the protection of high tariffs, which might even be prohibitive. This has been true of industrial development in all countries, including the United States. But Brazilian industry has shaken off the initial artificiality, as is shown by data already presented. The maxim "In this house are bought only iron, salt, gunpowder, and lead" has lost significance, as Brazil is producing in its own mills 36 per cent of the iron and steel it consumes, and will soon produce 60 per cent. It no longer imports salt; it produces all types of gunpowder, including double base; and it has already set up a lead refining industry.

Also of great importance is economic planning, which, a few years ago, did not exist. The government is adjusting production to the needs of a controlled economy, with national defense as its supreme objective. In spite of everything Brazil has done, some branches of its national industry still require improvement, either because of primitive methods and consequent high costs, or because of excessive dependence on foreign raw materials. This transformation is now under way and at a rapid pace. The iron and steel obtained with charcoal, which is transported by mule back, will now be substituted by the iron and steel processed with coke. Brazilian coal is already supplying more than half of

the domestic consumption. Paper factories will use the wood pulp extracted from Paraná pine. This same Paraná pine will also supply the cellulose needed by the rayon and explosive industries. Sulphuric acid, up to now derived from Chilean or American sulphur, is now obtained from pyrites. Huge reserves of bauxite will be used by two plants that will manufacture all the aluminum used by Brazil. The opening of the alkali industry is announced. The new Import-Export Bureau of the Banco do Brasil has placed foreign trade at the service of industry. The Carteira de Credito Agricola e Industrial (Farm and Industrial Loan Bureau) has already helped to solve the problem of high interest rates. The total amount of credits of the Banco do Brasil, which directly or indirectly assisted industrial activities, exceeded in 1941 one million contos.

6. BETTER EQUIPMENT FOR BRAZILIAN INDUSTRY

Brazilian industrialists have never displayed much interest in foreign markets. With high tariffs guaranteeing the internal market, he could count on large profits which were, in many cases, the result of high interest rates usually charged by banks. The Banco do Brasil, aware of the importance of industries, has established low interest rates for industrial financing.

The present war cut off the Latin American and South African markets from numerous European and Japanese manufactures. As a result, they had to pay extraordinarily high prices for textiles and synthetic yarn, semimanufactured and manufactured iron products, machinery, instruments, and electric material. Exportation of such products from Brazil increased considerably, and a scarcity in the Brazilian market followed. Concerned with the problem of imports, the government adopted ways and means to control

exports in order to safeguard internal market requirements, without neglecting the more urgent needs of foreign clients.

Cognizant of the heavy flow of foreign manufactures into the Brazilian market in 1920, a flow which proved to be a detriment to the national industry, the government is taking definite measures to place Brazilian industry on a solid basis in preparation for European competition after the war. These include the development of certain raw materials, particularly mineral and chemical.

The chapters of this book pertaining to the principal industries in Brazil reveal that the country today needs less capital than equipment to develop its productive capacity and its transportation systems. Quoting Churchill in relation to the industrial future of Brazil, we may say to the United States: "Give us the tools and we will do the job."

II

FOODSTUFFS

1. GENERAL SURVEY

A GLANCE at the map of South America shows a country, the third largest in the world, commencing, at its northern extremity, in the Northern Hemisphere and ending, at its southern extremity, well inside the Southern temperate zone. In one region there is the forestal exuberance of the Amazonian jungles while in another there are the broad pampas lands. En route from one end to the other one encounters other variations, including desertlike stretches, swamp lands, brush and scrub land, broad flat plains, and gently rolling hill country. In variety, little is missing except, possibly, polar lands. With these natural endowments the ground was naturally set for large production of foodstuffs. However, an essential factor was missing: man power.

True, it is possible to develop a foodstuffs industry based strictly upon the extractive products—yerba maté, wild oleaginous seeds, manioc, wild corn, etc.—which require relatively little labor; but it would be fragile, whereas a solidly built structure demands continuous supplies of a more or less standard product. At first the colonists depended, for labor, upon direct immigration; but, finding it slow, they turned to slave labor. With this they developed the first large-scale foodstuffs industry, sugar. Some years before the abolition of slavery, other immigration currents moved into the country, first from Europe and then from Asia. New hands brought new agricultural products but, in general, these newcomers restricted themselves to purely local prod-

ucts because of their limited means. Coffee, which still required much time and labor, was mainly grown by the old families. The large profits from coffee, however, soon attracted many of the newer hands, and coffee became an easy road to quick wealth—so easy that Brazilian agriculture rapidly turned into a monoculture. The other products did not disappear but were grown in a half-hearted fashion.

With the coffee crisis and the coming of the Vargas Administration, however, agriculture developed an entirely new aspect. Diversification was emphasized, and Brazil, with more labor available, developed a greater variety and quantity of products. The government has actively supported this diversification, helping through indirect means, particularly on the technical side. Industrialization has kept pace with these changes and has evolved, of late, in the direction of getting full value for by-products.

In the animal industry, the number of working hands was not important; progress in this was early, compared to agriculture—which not only concentrated on a single product but exported a major part of that product prejudicing the opportunities of a domestic transformation industry. In the animal industry, transportation difficulties soon forced a high degree of local transformation.

Complementing these strictly Brazilian developments in foodstuffs manufacturing is the growth of industries founded upon the importation of basic materials, such as wheat or hops or malt. These grew almost in strict accordance with the purchasing power of the consuming market, and only lately have they sought the overseas market.

A new development in this field—and a very important one—is now taking place. The dehydrated food industry is being organized for large-scale operations in São Paulo. It is to include essentially eggs and butter, for both of which there are enormous possibilities in Brazil. Dehydrated bananas are already on the market, and Brazil is the second largest pro-

ducer of bananas. Coffee extract in São Paulo and dehydrated cocoa in Bahia are just two related activities bound to be developed to a considerable extent.

Such have been the trends in the three great branches of foodstuffs manufacturing. Ten years ago each was struggling with the problems in its own field. Now the three are co-operating within a single common field, and, if ever there was harmonious action, it is brilliantly evident in this industry. The extent to which one branch aids another, by supplying either some direct basic material or some indirectly connected product, has greatly broadened.

2. DISTRIBUTION OF PRODUCTION BY STATES

Contrary to expectation, in São Paulo, the great farming center of Brazil, the principal foodstuff manufacture is meat, which accounted for 467,200 contos of the state total of more than 1,869,500 contos. This total was 27 per cent of the national total. Second in importance in foodstuff manufacture was the processing of cereals, grains, coffee, etc., which totaled 397,500 contos. Others which followed in importance were beverages, wheat flour, vinegar, edible vegetable oils, and sugar.

After São Paulo in foodstuffs manufacture came Rio Grande do Sul, whose output totaled 1,139,900 contos or 17 per cent of the national total. This state also depends heavily upon the packing trade and, leading Brazil in livestock, her meat output is of considerable value, being the largest in Brazil. This industry had an output valued at 494,300 contos. Beverages were second in importance—which may be explained by the heavy beer and wine production. The wheat production is the largest in Brazil, but the heavy importation of that cereal into the country, fifth in volume in the world, has caused a larger milling industry to develop elsewhere, making Rio Grande do Sul the third largest in milling.

Other industries of some significance are cereals processing, lard manufacturing, canning, and baking.

Minas Gerais, the third largest producing state in food-stuffs manufacture, also relies heavily upon meat production: of the total 1,093,800 contos nearly 460,000 contos was meat packing. The important role that the livestock industry plays is also evident in the output of the second and third most important products—butter and cheese, 148,800 contos and 119,300 contos respectively. This state accounted for 16 per cent of the national total.

Since the Federal District is a strictly importing unit, its leading industries reflect a distinctly different make-up—the processing of cereals, coffee, and other products being most important with an output valued at 250,500 contos out of the total of 920,500 contos. Second in this list is wheat flour milling which has long imported wheat from Argentina and made the flour near the port of Rio de Janeiro. Wheat flour manufacture was valued at 206,600 contos. Following this is the making of beverages, much of which is of soft drinks and beer. The following industries are of decidedly secondary importance: baked goods, roasted coffee and tea, meat, preserves, and cheese. The Federal District produced 13 per cent of the total of the country.

Among the states with some form of primary production, Estado do Rio is next in importance—its output being 389,200 contos, or 6 per cent of the total. As in the other states, except the Federal District, meat is the principal product. It is valued at 108,400 contos, while sugar is second with 95,300 contos. These two outstanding products dominate production; and from them to the third, bakery goods, there is a considerable drop in value.

It will be noted that the foodstuffs manufacturing center of Brazil is in the Southeast. The large herds of livestock and the abundant variety in agricultural products promote a series of combinations in industry which in its total raises the

aggregate of the state. The Federal District is an exception, but it must be noted that, other than the imported wheat, the large supplies near by assure its leadership. Further to prove this point take the case of Pernambuco. With a large agricultural output, this state is practically limited to sugar, and that industry alone has developed on a large scale. Bahia also is pertinent to the point, as being the leading producer of cacao and having little else with which to bolster the general total of the state. Another factor of importance in this industry was the fact that the ports of the Southeast and South were perfected early and the industries there established a leadership which has been maintained ever since.

Another factor in the location of the industries which can hardly be overlooked is the centralization of the population in this district—a sufficiently impressive point alongside the fact that the principal product of practically all units is meat in a country where refrigerated shipments are of relatively small volume, and where the temperature is relatively high.

3. MEAT

As was evident in the previous section, meat is the principal food industry in Brazil today. More than 1,000,000 tons valued at 2,100,000 contos were produced in 1938. This, however, does not include the production of jerked beef (*xarque*, as it is known in Brazil), the output of which was approximately 119,000 tons valued at 241,300 contos. In 1939 the output of meat rose slightly to 1,158,000 tons valued at 2,500,000 contos, while the jerked-beef output increased to 202,100 tons valued at 291,600 contos.

There are several reasons for the continued large production of jerked beef. First, this product persists in the favor of the conservative population of the interior. Jerked beef has always been the most logical solution to the problem of

preservation from spoiling in a country where transportation is difficult and a relatively warm climate where the number of livestock is smallest makes for quick spoiling. A plausible answer of the twentieth century would be canned meat; but this is higher priced, and it does not serve for the genuine Brazilian dishes, so that jerked beef holds its own.

The history of the meat industry in reality begins with the production of jerked beef, which definitely established itself in the latter part of the nineteenth century with an intensification of production. Prior to this time some fresh meat was sold; but the principal value of the livestock lay in the dairy products and the hide. Jerked-beef production originated in the northeastern states, but made a great advance with the shift of the industry to Rio Grande do Sul; and ever since then this state has held the dominance in this type of meat production. Its annual output now is nearly 50,000 tons while that of the second largest, Minas Gerais, is about 17,000 tons. Exports are small, averaging 300 tons annually. On the other hand, imports of jerked beef are practically six times the exports.

The packing industry in Brazil began during the World War of 1914-18 with the establishment of a plant in Barretos, São Paulo, the fattening grounds for hoof-driven herds from the interior regions of that state, Minas Gerais, and Goiaz. This was the forerunner of other plants, erected partly by foreign capital, which rapidly gained a foothold in the local as well as the foreign markets. The advantage of the Brazilian export packer was the fact that he was much nearer the principal European markets than packers in the supplying centers of Asia, Africa, and Oceania. Improvements in shipping methods were accompanied, in Brazil, by improvements in the livestock. These two factors greatly aided expansion of the industry and augmented not only the quantity of exports but also the numbers of by-products.

There are two distinct types of meat packers in Brazil:

those which are regularly inspected by the federal health authorities, and the *matadouros municipaes*, which are, in general, village slaughterhouses subject to a semirigid control. In the first group there are 3 common slaughterhouses, 14 packing houses, 67 jerked-beef establishments, 148 pork-products establishments, 37 canned-meat and fats manufactures, 111 distribution centers, and 31 by-products plants. These slaughter annually two million cattle and one and one-half million hogs.

The principal production is of beef, in which São Paulo and Rio Grande do Sul are dominant, accounting for 29 per cent of the total. As in any country with sufficient grazing grounds, beef cattle are the most important of all types of livestock, because of the abundant by-products and the high demand for the meat itself. No doubt the great cattle countries to the south had considerable influence despite the fact that in the settling of the state of São Paulo cattle were among the first imports. In Brazil, the distribution of livestock is exceedingly irregular. Beef and pork production is concentrated in the South and Southeast. Lamb and mutton production, while strongly centralized in Rio Grande do Sul, is extremely widespread. Goat-meat production is, on the other hand, a virtual monopoly of the Northeast.

Meat production has been the most important of the primary industries in Brazil since 1937, and with its further rise in output it may very well continue to retain leadership. Even counting alone the output of slaughterhouses and packing plants under Federal statistical control, one finds that in 1937 it had a value of 1,862,100 contos while in 1938 it had risen to 2,100,000 contos. In 1939, as we have said, the value was 2,500,000 contos. This large output gives Brazil sixth place among producing countries, following the United States, the U.S.S.R., Germany, Argentina, and Great Britain.

In the total output of meats, Rio Grande do Sul occupies first place with 24 per cent of the national total, São Paulo occupying second place with 23 per cent. Minas Gerais also is important, with 22 per cent of the total, followed by Estado do Rio with 5 per cent and Bahia with 4 per cent.

Exportation of meat has increased with the war, as is evident from the shipments: 1939, 67,000 tons; 1940, 158,600 tons; 1941, 116,100 tons. Of the 1941 shipments, practically 55 per cent was canned meat—a natural consequence of the necessities of war food supplies. About 10,000 tons of tin-plate was necessary for the 1940 production, and the 1942 figure is likely to be 28,000 tons.

4. PROCESSING OF COFFEE, GRAINS, ETC.

The simplicity of this processing industry and the fact that it is a necessity, even to the small colonial groups in the hinterland which are almost autonomous, make it one of the most widespread industries. Production was valued in 1938 at approximately 1,024,000 contos, of which 400,000 was in São Paulo and 250,000 in the Federal District. Minas Gerais and Rio Grande do Sul were accounted respectively for 115,900 and 103,900 contos, and were followed by Pernambuco, Paraná, Santa Catarina, Estado do Rio, and Bahia.

The leadership of São Paulo and the Federal District can be traced to coffee. São Paulo is the largest coffee producing state, while the Federal District, a large consuming center, ranks second or third coffee shipping port, placing heavy demands on this type of industry. These two centers are important in the processing of the cereals also, principally wheat. São Paulo, growing much rice and corn, has large processing plants for these grains.

Minas Gerais and Rio Grande do Sul are grain centers with a relatively high output, the former specializing in rice,

corn, and coffee while the Gaucho State, Rio Grande do Sul, leads the other states of Brazil in the growing of wheat, oats and barley.

The close relationship between the cultivation of these crops and their processing makes it impossible to distinguish clearly which is the underlying progressive element; but the processing plant has been a significant factor in removing many of the former which were burdening the agricultural industry. Mention may first be made of transportation. The insufficiently developed transportation system makes it necessary that shipments be reduced to the limit in weight and volume. Processing the crop close to the place of cultivation is of great assistance. Standardization of the product (the struggle for which began with the present Administration) is now bearing fruit in an increased trade in these products, and in the stabilization of agriculture as a whole with steadier prices for the different kinds. Third and probably least important to the agriculturist, but of general national benefit, is the fact that the processing plants make it possible to get the full value of the raw wheat or other grain, saving what formerly was wasted. From parts of rice, for example, that were formerly discarded, are now made bran and *quirera*.

5. BEER, WINE, MINERAL WATERS, ETC.

The first large beverage plants made beer, and most of these began operation in the 1880's and 1890's. As today, they made not only beer but soft drinks and, in most cases, ice. The bottling of natural mineral waters was also of considerable importance. Distilling was a minor industry, and today, exclusive of the *agiuardente* (rum made from sugar) and wine making, little change is noted in this field. Probably the newest and most rapidly developing beverage industry is that of artificial mineral waters and carbonated water.

In 1937-38, estimates of the output ranged from 650,000 to 670,000 contos; in 1939, it rose to 847,300 contos.

The progress registered in beverage making is also reflected in the imports. In 1913, the purchases abroad exceeded 79,800 tons; today they are less than 5,800 tons. A detailed list of beverage imports reveals the strong and weak points of the industry and shows that table wines account for the larger part of the present imports. These, in order of importance, are: table wines, whisky, port wine, bitters, champagne, geneva, cognac, beer, and grapejuice. However, it is of greater importance to observe the trend of each; with the exception of whisky, all show a tendency toward smaller imports, largely because of the substitution of the corresponding domestic beverage.

The presence of many foreigners in the large urban centers, where there is the largest amount of drinking, makes difficult a strictly accurate judgment of habits. Appearances point to a great liking for beer and the soft drinks, particularly in the summer. In the cooler part of the year more wines are consumed. Mineral waters largely replace the soft drinks of other countries, which is unfavorable to the flavored drinks. New products, incidentally, strictly Brazilian, are bottled guarana and yerba maté, which have made their own way into favor and now have begun to be exported. In the interior, away from the cities, most drinkers favor *agüardente*, because it is easily made locally or is modestly priced. People who do not care for strong drinks generally take mineral waters. *Agüardente* is also known as *cachaça*, and often a man from the back country is said to be a drinker of *cachaça*.

A peculiar aspect of brewing is that whereas the development of the other beverage industries has been a natural growth, the general tendency of breweries has been to consolidate into fewer companies rather than to multiply. With the possible exception of some new firms, all unim-

portant, the brewers at the beginning of the century are still brewing.

Before the World War of 1914-18, Brazil imported 580 to 600 tons of beer annually; in 1940 the total was 27 tons, and almost the same amount was exported. The production of beer thus practically equals the domestic consumption. In 1939, the total output was 2,077,000 hectoliters, valued at 388,200 contos; in 1938, 1,856,900 hectoliters, and in 1937, 1,952,500 hectoliters. For comparison, the production in 1925 was 1,422,700 hectoliters.

The Federal District had an output of 1,020,400 hectoliters in 1939, or approximately 47 per cent of the total, while São Paulo had an output of 776,400 hectoliters, or 40 per cent of the total. Rio Grande do Sul, the grain center, was third with an output of 170,800 hectoliters, which was but 8 per cent of the total. Others were Paraná with 3 per cent, Santa Catarina with 1 per cent, followed by Estado do Rio, Minas Gerais, Amazonas, and Pernambuco. Of the five principal producers, Paraná and Santa Catarina have declined in output since 1925. The concentration of the industry in the Rio de Janeiro and São Paulo zone makes for a restricted exporting zone and a widely spread importing zone. The annual volume of sales approximates 40,000 tons. Of this, Bahia, Ceará, and Rio Grande do Sul are the principal importers with more than 3,000 tons of imports; after them come the states of Pará, Pernambuco, Santa Catarina, Amazonas, and Paraná.

The constant efforts of the brewers and the government to stimulate the production of cereals and hops has resulted in some increase in these, but no definitely reassuring results have been attained. The imports of the main raw materials of beer in 1940 were: barley, 2,400 tons; malt, 12,300 tons; hops, 375 tons (it is not possible to state that all these quantities entered directly into beer).

Wine still continues to form the larger part of the bev-

erage imports of Brazil. Unlike beer, which may be made from imported raw materials, wine must be made close to the vineyards where the grapes are grown. Production thus depends on the growing of grapes in Brazil. Official statistics show that the state of Rio Grande do Sul leads with 133,200 out of the total of 183,900 tons grown. The state of São Paulo is second with but 12,000 to 13,000 annually. Except in one state the grape production is insufficient to support a local industry; and the production of that state is hardly of a size to satisfy the demand of a nation derived chiefly from the Mediterranean peoples. Other fruits might be used; but the common temperate zone fruits are grown only in small quantities, and the imports of wines made from such fruits amount to as much as 21,000 tons annually. It has also been suggested that the tropical fruits, of which Brazil has such quantity and variety, might be used. The juices of these, however, do not fall under the definition of "wine," and they resemble it only in that they also are made from fruit.

Wine imports in 1913 totaled 69,000 tons; in 1940, 5,000 tons. Exports are small, being less than ten tons annually. Wine production shows an exactly opposite trend, having been 266,200 hectoliters in 1925, more than 375,900 in 1929, more than 587,788 in 1938, and 661,250 hectoliters in 1939. In 1939, Rio Grande do Sul led with a production of 490,200 hectoliters, or 80 per cent of the total, and São Paulo followed with but 87,900 hectoliters, or 10 per cent of the total. Minas Gerais with 37,130 hectoliters was in third place, and Paraná with 8,890 was in fourth. As was explained, the production of Rio Grande do Sul is dependent upon the large grape production of that state.

Brazil also produces nectar and champagne on an appreciable scale, the output of the former being concentrated in the state of São Paulo which produces about 35,000 hectoliters, or 50 per cent of the total of the country. Other important producing centers are the Federal District and the

state of Parahiba. Champagne production totaled 15,300 hectoliters, of which 13,000 came from Rio Grande do Sul. São Paulo, in second place, produced but 2,250 hectoliters.

Agüardente, or *cachaça*, is made from sugar cane; it resembles somewhat the rum of the West Indies, but has a recognizable fragrance of its own. This beverage is made in all the states but is largely localized in the states of São Paulo, Estado do Rio, and Minas Gerais, where the greatest amount of sugar cane is grown. These three states produce considerable amounts of sugar; but in the output of this they yield first place to Pernambuco, which is only fourth in cane production. Pernambuco makes little *agüardente*, concentrating on sugar and alcohol while the three other states manufacture all three products. The annual output of *agüardente* is about 1,400,000 hectoliters, of which São Paulo makes 400,000, Estado do Rio 302,000 and Minas Gerais 180,000 hectoliters. Paraná and Rio Grande do Sul also make some.

There is a small manufacture of vermouth, bitters, and cognac which amounts to about 31,800 hectoliters annually. Although all states produce one or another of these beverages the principal industry is located in the state of São Paulo, the Federal District, Estado do Rio, and Rio Grande do Sul.

Mineral water is drunk little if at all for its medicinal properties, the principal object being enjoyment of the carbonation. Soft drinks have not come into favor as in the United States, and the mineral waters industry benefits. Another advantageous circumstance is the fact that Brazil is largely a tropical or subtropical country, with a climate that encourages the drinking of such waters, either pure or mixed. The magnitude of the demand has brought an artificial mineral waters industry into the field once dominated by the natural mineral waters, and it has an output now more than two and one-half times these.

Production of the natural mineral waters in 1936 amounted to 13,723,900 liters which in 1939 rose to as much as 17,622,200 liters, the percentage increases in the intermittent years being 7 per cent, 10 per cent, and 9 per cent. The output of artificial mineral waters, which in 1939 totaled 42,759,000 liters, had increased 3 per cent, 8 per cent and 23 per cent in the respective years.

Natural mineral waters bottlers tend to name their products for the localities from which they come, thus calling attention to the distinctive characteristics of these and assuring continued sales. Because few bulk shipments of the waters are made, the production becomes a true local enterprise; and in the bottling there is a noticeable localization of production in those centers which have the fountain sources. Thus Minas Gerais with its Lambarí, Caxambú, São Lourenço, etc., is the leading producer of natural mineral waters and accounts for 40 per cent of the total production. Transportation facilities, which are constantly improved by the traffic that goes to the spas, enable the local bottlers to make a regular distribution of their goods, which aids materially in the maintenance of the leadership by this state. It contains fourteen enterprises with a capital of 17,600 contos, employing 490 persons.

São Paulo, with its water centers, Lindoia and Prata, is important, and in 1939 accounted for 21 per cent of the total production. It has twenty-four firms in this field, with a capital investment of 6,400 contos and 160 employed persons.

Also important in this industry are the Federal District and Estado do Rio, which have the waters of Federal, São Gonçalo, Salutaris, etc. The former, which produces 15 per cent of the total, has four firms engaged in this field, while the latter produces 14 per cent and has thirteen bottling firms. In all, twelve states produce mineral water—the newest states to enter this industry being Espírito Santo and

Parahiba. In the entire country, there are eighty firms in this field with a total capital of 30,400 contos.

Among the manufacturers of the artificial mineral waters, the state of São Paulo is the most important with 44 per cent of the total; the Federal District is second with 25 per cent, followed by Rio Grande do Sul, Minas Gerais, and Pará. Exports are still small, and in 1941 totaled only seven tons, valued at nine contos.

6. SUGAR

Sugar cane was introduced into Brazil soon after its discovery in 1500, and conditions proved to be favorable in two far separated parts, the province of Pernambuco in the Northeast and the province of São Vicente in the Southeast (now the state of São Paulo). Brazil, not long after, entered into a sugar monoculture economy which brought a persistent increase in production of cane and for a period placed this country on a level superior to all other producing countries. The culture of sugar, then concentrated in the Northeast, passed through a "golden era" and created fabulous fortunes. The expulsion of the Dutch invaders shifted part of this culture to the West Indies, and the manufacture of beet sugar in Europe threatened Brazil's supremacy more and more. Many other sugar cultivating centers have risen since then; but to this day Brazil remains second in sugar cane production, led by Cuba.

After having played an important role in the export trade, sugar became a strictly domestic product with the necessities created by the rising internal demand. Exports during the first decade of Independence (1821-30) amounted to 479,900 tons, or 30 per cent of the total exports of the country, but thereafter tended to decrease at an accelerating rate. A provisional halt in this decline took place on the initiation of refining after 1880—previously the product had been *bruto*

(raw). After having long been an essential element the industry entered a period of great agitation, and sugar represented but 1 per cent of the total exports at the turn of the century.

By 1917, refined sugar had made great progress and amounted to 51 per cent of the total sugar output. Of the 215 refineries, 141 had modern equipment. After oscillations in both production and trade the crisis of 1930-33 finally led to the creation of the Instituto do Açúcar e do Alcool to further the interests of the sugar industry by withdrawing surplus sugar from the market for use in the production of alcohol. From the disturbed conditions began to develop a new orientation in the form of statistical stock control, annual quotas, and the installation of large alcohol distilleries (some with a capacity of 60,000 liters daily)—the first of which were at Campos in Estado do Rio and Cabo in Pernambuco. However, the new developments have not been in the field of manufacture alone; considerable improvements have also been made on the agricultural side, in irrigation, fertilization, and financial aid to growers.

Now, production fluctuates around 1,200,000 tons, Pernambuco providing approximately 32 per cent of the total, São Paulo 14 per cent, Estado do Rio 13 per cent, Minas Gerais 13 per cent, and Alagoas 10 per cent. Outside these states, except in the Federal District, production is insufficient to meet the local needs. Exports have continued to fall, and in 1941 totaled only 23,000 tons.

Although there are fewer refineries than mills (291 against 326), the refineries produce 69 per cent of the total output and the mills only 31 per cent, which demonstrates the greater importance of refineries in the sugar economy of the nation. The general yield of sugar from cane crushed in these plants is 10 per cent.

One of the most serious problems in sugar production is the irregularity of supply of cane; and regularity in this de-

pends on the obtaining of a regular and sufficient supply of water in the germinating and growing period. Inasmuch as the greater part of the Brazilian crop is grown in the semi-arid Northeast and the hinterland regions of São Paulo and Minas Gerais, where rain cannot be depended on to fall during this period, the water problem is serious and has long been waiting solution. Steps toward irrigation have already been taken, and it is not at all impossible that these will lead to large-scale irrigation works.

7. WHEAT MILLING

Wheat, grown in all climes, has had its greatest development in the temperate zone, where it is the "staff of life." And the great influx of immigrants from temperate-zone Europe brought to Brazil, a tropical and subtropical country, many people who persist in demanding wheat-flour products. The result is a serious food problem, for the climate of Brazil does not lend itself to extensive wheat growing. It is noteworthy that Brazil, which has abundant agricultural surpluses of many types, ranks fifth in the importation of wheat.

The present Administration has taken measures to solve this problem by encouraging a greater production of wheat, and the substitution of other flours for wheat. The program for greater wheat production includes establishment of seed stations, opening of cooperative fields, distribution of seed, relaxation of restrictions on agricultural loans, and search for seeds suitable to the different climates of Brazil, in order that a much greater area of the country may be opened to wheat. Some favorable results have been obtained with the Adlay variety, and much interest has been shown in it.

The substitution program at first encountered difficulties due to the lack of the substitute flours, manioc, corn, and rice; but later it became possible to set the mixture per-

centages for baking flour at 84 per cent wheat, 8 per cent manioc, 5 per cent corn, and 3 per cent rice. Flour for spaghetti, macaroni, etc., need not comply with the above percentages; for these, a mixture of 90 per cent wheat and 10 per cent manioc flour is authorized.

However, the relatively high cost of production is a basic disadvantage of Brazilian wheat. A just margin of profit, in general, requires a price of thirty-six milreis per sack of sixty kilograms, and accordingly the Serviço de Fiscalização do Comércio de Farinhas fixed this as the trade price for all transactions in home-grown wheat. The violent fluctuation of wheat prices, however, does not permit a rigid regulation of the price of imported wheat, which many times has fallen below the thirty-six milreis level, placing the local producer in an awkward position. Consequently importers were required to pay a tax which would balance this disparity, two-thirds of the sum paid being diverted to the benefit of domestic wheat production and the processing of the product according to the plan set forth by the government, and the remaining third going to a fund which will help cover the total difference in value arising from the divergence in price between the imported product and the national product and the quantity of the latter which was consumed by the small millers of domestic wheat. Thus, the economic advantage to large milling concerns from a lower price of foreign wheat has been nullified.

The annual importation of wheat amounts to about 900,000 tons while that of wheat flour, expressed in terms of wheat, amounts to about 45,000 tons. Thus 4 to 5 per cent of the combined flour and grain imports reaches Brazil as flour. Taking into consideration the milling of the domestic wheat, one arrives at a fair estimate of the annual volume of production of the domestic mills. In 1939, the output of wheat flour was placed at 615,300 contos while the output of the mixture flours, manioc, corn, and rice, was 45,200

contos. The amount of wheat flour manufactured in 1938 was estimated at approximately 595,300 contos.

The Federal District, in its ideal seacoast location, can mill the imported wheat to the best advantage and is the principal milling region. Its output in 1938 was 206,600 contos—slightly more than one-third of the national total. São Paulo and Rio Grande do Sul were second and third with outputs of 172,600 and 118,500 contos. The other states had small outputs: Paraná, 36,900 contos; Pernambuco, 25,600 contos; Estado do Rio, 16,700 contos, Bahia, 11,300 contos; and Santa Catarina, 7,100 contos.

The consumption of wheat is heavier in the Southeast and South than in the North, and this is one factor determining the distribution of the factories in the above list. Another is the fact that immigration settlements have been larger in this region than in the North. An interesting difference in consumption arises from the variations in the transportation facilities: consumption ranges from an extreme low of two kilograms per capita in some of the more populated centers to a high of as much as thirty kilograms. In general, however, the consumption of wheat in the North, Northeast and Center is low; the people turn to the cheaper and more accessible starches, led by manioc and its by-products.

Closely related to the milling industry is the manufacture of spaghetti, macaroni, etc. The free movement of flour in trade makes good any deficiency in the local manufacture and because of the centralization of flour milling, the coast-wise movement of flour amounts to as much as 100,000 tons annually, most of it from the Federal District to the North and Northeast. This permits the establishment of plants for making macaroni, spaghetti, etc., in many parts of the country; but about 60 per cent of the total of about 100,000 tons is located in the state of São Paulo, because so many Italians have settled there. The Federal District has an output of about 14,000 contos annually, and Minas Gerais and

Rio Grande do Sul follow with outputs valued at 12,600 and 11,000 contos. Pernambuco and Paraná also produce more than 2,000 contos' worth. A passing glance at the modifications enforced in the trade in these products caused the importation to drop from 53 tons in 1913 to 9 tons in 1940. The small export trade in the product totaled 51 tons in 1940.

Another industry heavily dependent upon flour as a raw material is that of the making of bread, biscuits, cookies, etc., valued at approximately 419,000 contos in 1938. Bread-making is not subject to the consumption tax and thus evades a strict statistical valuation of its output. A close approximation for each state, however, permits an estimate for the whole industry. São Paulo with 94,900 contos is the principal state in the making of these goods, and the Federal District with 81,500 contos is a close second. Rio Grande do Sul, Minas Gerais, and Estado do Rio, respectively, had outputs valued at 51,000, 47,000, and 40,000 contos. Pernambuco, Paraná, and Santa Catarina followed.

Bread, as is well known, is a product of strictly local consumption, and thus its making varies with the people who eat it. Brazilians generally differ from North Americans in preferring the bun to sliced bread.

Biscuit and cracker production totaled 6,200 tons in 1938 and rose to 8,000 tons in 1939. Annual imports amount to about 6 to 8 tons, and exports increased from 6 tons in 1939 to more than 26 tons in 1940. Nearly 75 per cent of the total is produced in Rio de Janeiro and São Paulo—respectively 2,500 and 3,500 tons. Rio Grande do Sul, although the first to have a modern baking establishment in this business, was third in importance with 740 tons. Pernambuco, which made 680 tons, is noted for its special type of crackers. The localization of the industry tends to obey the density of population and thus favors the two leading centers named.

The war, thus far, has brought no serious difficulties in

milling, inasmuch as most of the grain is imported from the near-by country, Argentina. The related manioc industry benefited hugely by the cutting off of the Dutch East Indies supplies of tapioca and starch from the United States, which created a greatly enlarged market for its product. This development raises the question whether manioc flour should continue to be substituted in part for wheat flour or whether the manioc should not be devoted entirely to starch and tapioca making, with a return to pure wheat-flour bread.

8. ROASTING AND GRINDING OF COFFEE, TEA, AND YERBA MATÉ

The coffee roasting and grinding industry suffers the competition of families of the interior that roast and grind coffee at home but, in spite of this, is an industry of some size with a tendency to increase its output. In 1925 the coffee roasted and ground totaled more than 30,100 tons, valued at 148,810 contos. After almost an unbroken series of advances, the output reached 76,100 tons in 1939, valued at approximately 278,600 contos.

São Paulo is far in the lead in coffee growing; but its production of roasted and ground coffee was only 17,710 tons in 1938 as compared to the 17,530 of the Federal District, which does not grow coffee. There are several explanations for this apparent discrepancy, among them the above mentioned practice of roasting at home. Another factor of much importance is the coffee drinking habits of the *carioca* (people of the Capital, Rio de Janeiro). Their habit is to sit and chat while sipping their coffee, which thus plays an important social function in their life and requires frequent partaking. The *café* or *botequim* (place where they take coffee) usually has small square tables about which four persons huddle close together, so that conversation is the natural thing. In São Paulo, on the contrary, people usually drink coffee standing at a counter, which not only speeds the drink-

ing but also discourages social intercourse and the inclination to drink more.

Other states of importance in this industry are Rio Grande do Sul, which imports the bean and roasts it, Minas Gerais, and Estado do Rio.

The extreme fluctuation registered in the production of tea in Brazil under the consumption tax does not reveal the true nature of the trade inasmuch as the output for 1938 is recorded at 128 tons while in 1939 the total was 615 tons. It is true that the growers in the state of São Paulo have increased their output enormously in recent years; but there is still doubt as to the sudden change noted. The Paulista state leads in production—605 tons in the latest year mentioned against 10 from Minas Gerais, its only competitor. The output of Minas Gerais is recorded in another official source as having risen to 62 tons. Tea exportation from Brazil began in 1937 with 0.4 tons, and since then has been: 1938, 10 tons; 1939, 72 tons; 1940, 92 tons; 1941, 134 tons. Both types of tea—green and black—are produced in Brazil, the latter being considerably higher in output and general demand.

Yerba maté, or Brazilian tea, is much esteemed in the southern part of the country in the form of *chimarrão*. This is used in much the same way as green tea or black, and is the best substitute for the oriental tea which has ceased to be imported because of the war. However, the popular *chimarrão* is a distinctly different way of drinking yerba maté, sipping it through a tube dipped in a *cúia* bowl containing much finely ground yerba maté with varying quantities of boiling water. A third way of serving yerba maté has come into acceptance recently. This is the popular soft drink with carbonated water, *mate espumante*.

There are no exact data which indicate separately the amounts produced of yerba maté *cancheada* and *beneficiada*. The total is 95,000 to 96,000 tons in recent years, and

exports range from 50,000 to 60,000 tons (50,000 tons in 1941). Paraná leads in output, and in 1939 produced approximately 37 per cent of the total while Rio Grande do Sul and Santa Catarina each produced about 20 per cent. Mato Grosso produced a similar amount, but São Paulo's output is insignificant. It will be noted that the producing states are in the South and Center. The yerba maté tree grows naturally only in the extreme western parts of these producing states.

9. CANNING INDUSTRY

The history of the canning industry is practically that of canned meat since this was one of the earliest canned products and also is the most important. The exports of canned meat alone amounted to more than 48,000 tons in 1940 as compared to the annual output of canned fish (principally sardines), which was only seven tons, and that of canned vegetables, which is about 8,000 tons.

The greater part of the canning industry is in Rio Grande do Sul because of the location of the principal packing houses in the state, the greater catch of fish suitable for canning, and the production of the common canning fruits. São Paulo is second because of its large production of canned meat and vegetables. Estado do Rio has a considerable output of canned vegetables and fruits, while the state of Pernambuco in the Northeast produces about 5,000 tons of tomato preserves annually. A product which escapes strict classification is *goiabada*, or guava paste cake, which is packed in tins or wood or prepared paper. The output of this product is large in Estado do Rio and in the state of Pernambuco which not only grow quantities of guava but also produce much sugar, a great deal of sugar being required in the making of this preserve.

The imports of canned goods still included, in 1940:

canned meat, 15 tons; canned fish and fish extract, 487 tons; canned vegetables, 133 tons; and canned fruit, 1,763 tons. The imports of canned meat are offset by huge exports; and the only aspect worth noting is that the imports are usually such by-products as sausage and deviled meat. Of the common fish for canning, sardines, salmon, and cod, there is a distinct deficiency in the warm waters off the Brazilian coast. A special type of tuna is caught in tropical waters, but the canning industry has not taken it up. There is an abundance of fine lobsters, crabs, and shrimps in Brazil, waiting use. As for vegetables, truck gardening has been very slow in developing despite the fact that the climate and soil are favorable. Possible exceptions are tomatoes and green beans. The canning of fruits is also relatively unimportant because Brazil does not grow enough of the common table fruits and must import these. There are, however, great possibilities in such tropical fruits as pineapple, cashew, and tangerine.

10. VINEGAR

In 1913, Brazil depended heavily upon foreign supplies of vinegar, importing nearly 500 tons of which slightly more than 400 were from Portugal. In 1940 the imports had been diminished to 57 tons, and the domestic production exceeded 300 tons. São Paulo makes more than half of the total; the Federal District, about 13 per cent; Rio Grande do Sul, slightly more than 5 per cent; and Pernambuco, 5 per cent. Vinegar is produced in all the states. São Paulo has, in addition, a small acetic acid industry.

11. DAIRY PRODUCTS (BUTTER AND CHEESE)

Cattle were among the first domestic animals to be imported in great quantities into Brazil. In the accounts of the

trail-blazing westward drives into the interior of the country, frequent mention is made of the herds driven by the rear guard which was the settling group. In 1703, a fazenda was purposely created for the breeding of milch cows. In Santa Catarina, a plant was erected to make butter for export to Portugal, and early in the nineteenth century Minas Gerais was exporting about 60 tons of cheese a year. However, these early signs of progress were not borne out by later advances.

The first large modern butter factory was erected in the state of Maranhão in 1888; and soon butter making on a large scale spread widely through Minas Gerais also. However, the national production remained small up to the World War of 1914-18 and scarcely filled the needs of the people. Imports averaged 2,000 tons of butter annually, and between 2,600 and 2,800 tons of cheese. Progress in the succeeding years was more rapid. Butter ceased to be imported in 1936; in 1940, 23 tons were exported, and in 1941, 230. Cheese, on the other hand, has continued to be imported because of its many varieties and the preference of the consuming public for brands and types which are not always available within the country. However, Brazil exported 2 tons of cheese in 1940, and 75 tons in 1941.

The butter production in 1929 was 19,100 tons; in 1936, 28,900 tons. From that year onward, the production has been as follows: 1937, 31,600 tons; 1938, 36,880 tons; 1939, 43,240 tons. Minas Gerais produces approximately 50 per cent of the total, and the government is making extraordinary efforts in that state to develop a special exportable type of butter which will utilize its milk resources to the utmost. Rio Grande do Sul, with 18 per cent of the total production, is second, and São Paulo with 17 per cent is third. Rapid progress has been made in São Paulo in recent years with the establishment of more than ten modern factories in the city of São Paulo which use the raw milk of outlying farms. Approximately 95 per cent of the state production is the

sweet butter which is sold, in large part, to the Federal District and surrounding urban centers. Butter manufacture is relatively well developed in the South and Southeast because of the relative abundance of milch cows and the necessity of filling huge demands, which has practically forced the maintenance of a sufficiently large local supply center. A new campaign which is arousing interest is the development of the Northeast, whose possibilities have led to the erection of various dairy centers: in Bahia, at Conquista; in Pernambuco, at Pesqueira and the Capital; in Parahiba, at Campina Grande. Smaller points of concentration in the Northeast are found in Ceará, Piauhy, and other states.

Cheese production has always been of considerable importance in Brazil because the insufficient transportation facilities forced the milk producers at a distance from their market to convert their milk. To the consumer also, cheese is economical, saving the expenditure of huge sums to assure a fresh milk supply every day where the population is sparse and transportation is lacking.

There are more than three hundred factories in Brazil now which produce cheese of the well known varieties: Parmesan, Provolone, Cacio Cavallo, Prato, Edam, Ricotta, Pecorino, Roquefort, Gruyère, Gorgonzola, etc. The most popular of all, however, is the "Queijo de Minas" (cheese of Minas Gerais) which is similar in importance to block cheese.

The national output of cheese—which for years fluctuated between 20,000 and 25,000 tons—in 1934 was more than 33,000 tons; in 1936, more than 40,000; in 1937, 41,850 tons; in 1938, 42,780 tons; in 1939, 42,190 tons. Minas Gerais produces approximately 63 per cent of the total of the country, including Queijo de Minas. The Federal District is second with 12 per cent, and São Paulo is third with 9 per cent. Estado do Rio, in fourth place, sends its fresh milk to supply the needs of the large and annually increasing population of the Federal District and has little left for making cheese.

Pernambuco, Santa Catarina, and Rio Grande do Sul are of lesser importance in cheese making.

12. EXPORTATION

Exportation of foodstuffs has increased remarkably in recent years, principally as a result of the development in the market for meats and the increase in variety of products available for shipment. The products exportation of which has declined are very few. Meats lead the list of exports. After them come yerba maté and sugar, flours and starches (in general, by-products of manioc). Beverages also have tended to increase with growing shipments of beer.

In 1939 the shipments of manufactured foodstuffs amounted to 645,000 contos; and in 1940 they rose to 1,019,000 contos. The shipments of 1941, however, were larger still, amounting to 1,412,000 contos.

13. CONCLUSION

The heavy dependence of Brazil upon a monoculture, coffee, before 1930 was exposed by the turn of events after that as a dangerous weakness. During this time the population, which was increasing more rapidly than today, demanded a well balanced diet, thus causing Brazil to turn to foreign supply centers for many foodstuffs. This might have been excused had the local climate and soil conditions made it necessary; but Brazil, straddling the equator and extending into the temperate zone, could hardly afford a luxury of this nature. The present Administration, with its policy of self-help for Brazil, has worked for a closer co-ordination of industries and has given scientific, technical, and financial assistance to growers and producers. The fruits borne by this policy are reflected in the statistical information which has been referred to in this chapter. The value

of the by-products has also been stressed in an effort to lower the general cost of the original product. Attention has been called over and over again to the value of the international market, in an effort to raise the output. The increased output has brought another benefit in the stricter export control which is based on a more rigid classification of products.

These changes during the last decade have brought three distinct advantages to the foodstuffs manufacturing industry. One is the greater variety of products which makes possible new industries, and enables the established plants to use Brazilian products instead of foreign basic products. A second advantage has been the production of larger quantities of the primary products, which has given the manufacturer the promise of continued regular supplies in the greater amounts, enabling him to benefit by large-scale operation and profitable by-products. The great increase in oranges produced (seemingly nonindustrial) placed surpluses on the market which caused the installation of expressing machinery by which the oil could be saved, and the rinds used for marmalade. A third advantage has been the reduction of imported products, which is always justifiable from a strictly national point of view, in view of the great hardships that might be caused by difficulty in obtaining a necessity like food during emergency conditions similar to the one which the world is now experiencing.

A glance at this program and the trends of the manufacturing industry, however, discovers one weakness in the present agricultural system which will be difficult to overcome unless it receives the most serious attention: the relative deficiency in temperate zone products. Attempts have been made to overcome this almost inherent weakness, with a measure of success—clearly shown in the wheat problem, which was attacked not with imported methods but with an adjustment of Brazilian means to the situation. Seemingly a forlorn hope is the effort to make good the lack of European

table fruits; even in this case, however, work by the Obras Contra as Secas gives reason to think that certain parts of the Northeast may be transformed into a fruit empire similar to California in the United States.

III

SPINNING AND WEAVING

I. GENERAL SURVEY

SPINNING and weaving is the second largest industry in the country, with an output valued at 4,628,000 contos in 1938, at 5,627,000 contos in 1939, and estimated at 5,710,000 contos in 1940. One of the oldest industries, it began before the discovery of the country in 1500, with coarse weaves; even then the fine, long staple cotton was known in the more populous native centers. Cotton was the first fiber to be industrialized and, to this day, maintains its position as the leading textile fiber in Brazil. Its dominance is menaced, however, by the natural and artificial silk industry which in 1939 had an output valued at 1,367,000 contos against the 1,548,000 contos of cotton. The other textile outputs of 1939 were: linen, 151,000 contos; wool, 141,000 contos; hemp, jute, and similar fibers, 68,000 contos.

Several strictly Brazilian factors account for this order of importance of the textiles. Cotton culture, either wild or cultivated, extends throughout the majority of the states, so that it is possible for weaving and spinning to spring up throughout the country. This abundance of raw material, relatively near at hand, is important in view of the transportation difficulties which are normally present, and which are extreme today with the exceedingly large commodity movement from one end of the country to the other. Nineteen of the twenty-two federated units produce cotton textiles—eloquent proof of the wide diffusion of this industry.

Another factor in the importance of cotton is the very nature of the product, ranging from such coarse weaves as canvas to fine weaves which at times compete with silk. This diversity of qualities, permitting escape from the industrial and technical exigencies of the finer weaves, encourages a development in the coarser grades which, in its entirety, lifts the total output very high despite the fact that production may be devoted almost wholly to the lower types. The large output of the medium grades in Brazil, plus a sizable production of the lower ones, thus places this industry on a high level, compared to the other textile fibers.

The importance of natural silk production in Brazil can be traced in part to the suddenly increased demand for this cloth after 1937—the period of the upward swing in the Brazilian business cycle. A coincident development took place in artificial silk, or rayon (frequently mixed with pure silk to reduce the price). Brazil also produces raw silk and spins silk textiles. This development in recent years has aroused interest and has influenced the reduction of raw-silk imports.

Linen is the most suitable textile for wear in a country like Brazil where the summer, according to the region, lasts from six to ten months; and the large output finds an important outlet in the domestic market. Because the use of linen is so great, wool has a restricted field; recently the introduction of the new weave known as "Tropical" has stimulated the demand to an appreciable extent. Yet despite this adjustment to the market, climate continues as a fundamental detrimental factor to the growth of the woolen industry.

São Paulo is the leading state in the spinning and weaving industry and accounted for 2,900,000 contos, or 62 per cent of the total production, in 1938. Textiles contributed 1,800,000 contos of this total; yarns, 600,000 contos; textile manufactures, 200,000 contos; thread, 180,000 contos; string and yarn, 30,000 contos. The dominance of São Paulo results in part from the cheap electric power supply, the large local

supply of cotton, the high concentration of immigration groups from the industrial nations, and the early development of the dyeing and printing industry—the last probably being more a result than a cause. It is of interest to point out, in this connection, the importance of immigrants in this state. Brazilian women used to be disinclined to factory labor; but in São Paulo the immigrants from industrial nations accustomed to women working, broke this feeling down and stimulated women's entry into the factories. Besides, most of the other industries of the state require men workers, leaving a relatively large number of female workers available for textile manufactures.

Second in textile and yarn production is the Federal District, which in 1938 had an output valued at 345,000 contos, or 7 per cent of the total. The principal items in this were textiles (190,000 contos), yarn (93,000 contos), and thread (93,000 contos). The state of Pernambuco was third in production with 282,000 contos, or 6 per cent of the national total; Minas Gerais was fourth with 257,000 contos, almost 6 per cent of the total; and Estado do Rio was fifth with 253,000 contos, or 5 per cent. All these districts are far behind the leader, São Paulo. Their outputs are approximately equal because, with the possible exception of Pernambuco (which has a large cotton crop), each at one time or another was a heavy importer of the raw materials for its industries: raw cotton, silk, wool, linen, hemp and jute, or such finished or semifinished materials as yarns or textiles. These centers, in addition, serve consuming markets of almost equal size, the heavy surplus coastwise trade in these products going almost entirely to the state of São Paulo.

2. COTTON

Cotton manufacturing began, as we have said, among the Indians before the European discovery of Brazil, but was

limited to the fabrication of coarsely woven textiles. Years later, the industrial revolution in Europe brought cotton to the front as a low-priced industrial fiber of many uses. Colonial Brazil, with her large supply of long and short staple fibers, became one of the largest sources of raw cotton and, on the other hand, was practically forced to import the finished cotton goods from England and Portugal at an elevated price. However, the excessive cost of textiles stimulated production in the country; this was furthered also by the initiative of new settlers and by some Jesuits—the latter from the wish to have a cheap textile with which to win the Indians away from going nude.

The competition of the Brazilian textiles brought an answer from the mother country, Portugal—a Royal decree (1785) closing all colonial textile mills, which remained in force until the Court of Lisbon was transferred to Brazil, in 1808. Then the Prince Regent, Dom João VI, revoked the 1785 decree; but the close dependence of Portugal upon England brought about preferential tariffs which practically smothered the domestic industry during the major portion of the century. Even after the proclamation of the Republic (1889), this foreign competition maintained its force, and it was only with the World War of 1914–18 that Brazilian industry showed any signs of a revival. In 1913, the cotton textile imports totaled 10,000 tons while those of cotton string, sheets, stockings, clothes, etc., amounted to 3,000 tons. Brazilian exports of the same products in that year were *only one-fifth of a ton*; and production only 385,000 meters. Today imports average 3,000 tons and exports more than 300,000 tons, while production of textiles has increased to approximately 900,000,000 meters.

The production of cotton textiles is distributed through nearly all the states of Brazil; among these, however, São Paulo is the most important with 39 per cent of the total, which was 893,900,000 meters in 1939. Minas Gerais is

second with 16 per cent (140,000,000 meters). Pernambuco with 11 per cent (119,000,000 meters), Federal District with 10 per cent (82,000,000 meters), and Estado do Rio with 9 per cent (76,400,000 meters) follow. A curious development is noted of the following five important producing states, Alagoas, Sergipe, Bahia, Parahiba, and Maranhão, all of which are in the Northeast of Brazil. They depend heavily upon their own raw cotton supply, and the textile industry is one of the great stabilizing elements in the raw cotton trade in that section of the country. The factories of this region, in addition to sufficient supplies of raw material, have the decided advantage of large quantities of both the long and short staples—the former competing on equal terms with the Egyptian product when rigidly sorted. In this respect the mills of the Northeast are in an enviable position as compared to those of São Paulo, which rely on the short staple produced within the state but must turn to the Northeast for the longer staples.

Despite the splendid progress registered by this industry and the position which it has attained within and outside of the country, there is no doubt that its inherent competitive capacity is appreciably larger than is manifested as a reality at present. The natural advantages of the industry are at present bogged down by obsolete and inefficient equipment which heavily adds to the final cost of the product. Repeated campaigns for replacement of the machinery have resulted in scattered gains, but, on the whole, the industry continues on the too well trodden road. The net result has been the limitation of domestic consumption, principally of the manufactured articles which to many tourists seem to be priced surprisingly high. The lowest prices on home manufactures within the country are not really low, because the imported products with which they compete must pay high import duties and are in addition loaded with the local dealer's profit, which reaches surprising sums. This condition

added to the lack of advertisement of standard prices for the well known brands and also the sudden changes in types of product (principally from America), resulting in widely assorted varieties, confuses the consumer's sense of values and thereby upsets his customary judgment of quality.

The tendency in retailing of cotton textiles and manufactures in Brazil is to advertise price according to type rather than brand; that is, a shirt of "Tricoline" costs twenty milreis and a handkerchief of "Cambria" is seven milreis. Brand advertising is unimportant because of the lack of specialization and the manufacturer's tendency to accept orders from a retailer for special makes with the store label, thus forfeiting the opportunity to sell *his own brand* to the retailer.

3. SILK AND RAYON

The history of natural silk in Brazil may be summed up as follows: despite the production of small quantities of silk textiles in Brazil before the World War of 1914-18, most manufactures were from abroad. Subsequently the enlarged domestic consumption permitted larger imports and at the same time encouraged the domestic weaving industry. The rise of the Brazilian industry later dislodged the foreign manufactures from the national market. This was the record up to 1937.

Artificial silk, or rayon, has been produced in Brazil only since 1926, but it diminished the imports of natural silk products after the Coffee Crisis of 1929 and the dull period of 1930-34. From this period until 1937, the domestic natural silk and rayon textile manufactures advanced hand in hand, gaining considerable territory in the domestic market at the expense of imported products. Since 1937, however, another element has entered in—the increased manufacture of rayon and staple fiber in Brazil, which has not only dimin-

ished imports of such products but also created a huge market for artificial silk goods within the country. Under this pressure, raw-silk imports also have tended to diminish and have met with stronger competition from the domestic raw silk, which, although not produced in sufficient quantities, is of a quality that permits mixed weaves with rayon and thus augments its all-around utility.

The output of rayon fiber in Brazil is concentrated in three factories in the state of São Paulo, with a total capital of 83,000 contos. Production commenced in 1926 at 32 tons, and had risen in 1933 to 919 tons. However, the greatest progress was registered after that, the output of 1939 being 6,849 tons. In addition to rayon fiber, staple fiber has been produced since 1938—in decidedly smaller quantities, because of the strong competition from cotton and wool. The output of staple fiber in 1939 was only 91 tons.

The leadership in natural and artificial silk production has shifted considerably. In the early years, Estado do Rio was the largest producer; later the dominance shifted to the Federal District; now the state of São Paulo produces over 4,700 tons, which is approximately 77 per cent of the total. The state of Pernambuco in the Northeast is second with 18 per cent of the total, and Estado do Rio is third with 3 per cent. With regard to Pernambuco, it may be noted that its output rose from only 56 tons in 1938 to 1,100 tons in 1939. In the other states the output fell off considerably, that of Estado do Rio being but 193 tons in 1939 and that of the Federal District 98 tons.

The great importance attached to rayon production in Brazil in recent years has naturally brought São Paulo forward because of the presence of all of the fiber producers in that state. Besides, the large number of Japanese colonists in that state have helped in the development of the raw-silk industry, to which they became adapted in their native land.

The importance of Pernambuco in this industry is due to

the trend toward mixture of cotton in viscose and fioco yarn weaves, while pure viscose and fioco weaves remain important. The latter fiber (in reality a type of staple fiber) was imported in relatively large quantities from Germany and Italy; but the suppression of these supplies with the war has turned the buyers to American sources. It is entirely possible, however, that this state in the Northeast, which, besides being the most important producer of sugar, is one of the most important cotton growers, may succeed in turning over its cotton linter and residues to the manufacture of this fiber should conditions require. Other sources of cellulose in this region which are exceedingly abundant are carnauba straw and sugar bagasse. Repeated experiments with the latter have had successful results in the manufacture of celluloid. Cellulose made from carnauba straw is newer and is still an experimental product, but tests clearly indicate its adaptability.

4. LINEN

One of the greatest injustices in nature is the fact that tropical countries cannot grow the fibers which are best adapted for clothing their peoples. This generalization is partly true of subtropical regions also, but some of these have local fibers which provide not ideal but at least satisfactory clothing. However, of all the materials linen is the most desirable; and it is made from a temperate zone fiber. Fortunately Brazil is not only a tropical country but also reaches into the temperate zone. This makes it possible for Brazil to grow the flax it needs for its linen textiles. However, it is only in the last two or three years that any direct attack has been made upon this problem. For that reason, domestic production satisfies but a minute portion of the total demand. An additional impediment to greater production of fiber is the relatively lower profit available from it,

which causes flax to be grown for seed instead. Linen also suffers considerable competition on the local market as a result of the governmental decree issued to encourage the production and utilization of substitute Brazilian fibers such as pacopaco, caroá, and guacima.

The trend in the linen textile industry is similar to that in many other Brazilian industries in which the raw material is unavailable. For years, the finished textiles were imported, with little attention to the flax from which they were made. Recently, the creation of the weaving industry has diminished the finished goods imports and augmented the raw material purchases. Here are the statistics: Linen manufactures imports in 1913 amounted to 1,800 tons; in 1939, 800 tons. In 1913, the imports of linen yarn and waste were slightly less than 330 tons; in 1939, approximately 820 tons. Domestic production of pure and mixed weaves of linen in 1913 totaled 302,000 meters; in 1939, 21,030,000 meters.

Another development which merits special observation is the sudden increase in output of pure and mixed weaves from 378,000 meters in 1937 to 16,560,000 meters in 1938. Part of the increase in output was from Estado do Rio and Rio Grande do Sul, but this was more than balanced by a drastic decline in production in the Federal District. The phenomenal increase was a result of the rise in São Paulo's output from 81,000 meters in 1937 to 16,182,000 meters in 1938. This sudden increase in output of the Paulista state obscures other facts of interest in the progress of the industry, noteworthy among which is the spreading of the industry to places that had never produced such textiles—for instance, to Estado do Rio which now ranks second in the production of pure linen textiles. Of still more recent origin is the industry in Pernambuco and in Santa Catarina which were fourth and fifth respectively in 1939 but had initiated production activities only the year before.

Domestic production of the mixed and pure linen textiles

totaled 21,027,000 meters in 1939, as was mentioned above, of which approximately 28 per cent of the total, or 8,111,000 meters, was pure linen. This proportion compares with that of 1938, in which 5,631,000 meters (34 per cent of the total) was pure linen, and that of 1937, in which 122,000 meters (32 per cent of the total) was pure linen.

The location of this industry is still determined by the fact that the raw material is imported and does not follow the regular rules of production activity. Thus it is that São Paulo is the leader in linen textile making while in flax growing it is far outclassed by Rio Grande do Sul (the third in linen textile making).

As a result of the campaign mentioned above, many other Brazilian fibers have come into use; and the most important are caroá, ramie, and pacopaco. The first, caroá, is a strictly Brazilian fiber which grows in the *sertão* (prairie) of the Northeast. A xerophilous plant, it withstands the occasional droughts of that region and is an invaluable "backlog" in the economy of the region. However, its use as a commercial fiber has added new value to the plant; and outstanding is its use in textiles to take the place of linen, principally the English product. Being extremely moderate in cost, it goes far toward satisfying the clothing needs of the mass of the people. Moreover, its durability makes a direct price comparison not wholly fair. Its regular price is approximately eight milreis per meter, while the price of domestic duck cloth is also eight and that of English make is thirty milreis. Further comparisons show that a domestic mixed weave of linen is sold at ten to twelve milreis per meter wholesale, while pure national linen varies between twenty-five and thirty-five milreis per meter. Another new textile, synthetic duck cloth, sells at thirty-five milreis as compared to the one hundred milreis charged for the imported product.

Ramie is also being exploited on a commercial scale in Brazil with appreciable success. Pacopaco, also a fiber of the

Northeast, despite its newness, with its finer texture looks better than caroá; but it suffers in that it requires a relatively higher amount of cotton mixture. Its price is also proportionately higher than that of caroá.

5. WOOL

Despite the fact that Brazil is generally termed a tropical country, it is necessary to give further consideration to the distribution of population which will, no doubt, explain why the market for woolen textiles, though small, is not accentuated, in that sense, as much as might be expected. In the high interior plains and in the temperate South, the temperatures vary in much the same manner as in the so-called Mediterranean climate. It is hard to figure exactly the consumption of wool in Brazil but an exceedingly rough estimate can be made from the following data: production of raw wool, 17,000 tons; imports of raw wool, 2,600 tons; imports of woolen manufactures, 500 tons; exports of raw wool, 3,600 tons; export of woolen manufactures, 40 tons. It will be noted from these data that the apparent consumption is from 15,000 to 16,000 tons annually or approximately one-half pound per capita.

A salient feature of this industry has been its encroachment into the market once a monopoly of the foreign-made woolens, especially textiles and blankets. In 1930 the importation of woolens amounted to approximately 1,000 tons, practically double that of 1940. Imports of rugs and carpets were also reduced substantially, from 220 tons in 1930 to only 65 tons in 1940. The Brazilian manufacturers of rugs and carpets have installed great improvements in recent years which enable them to compete effectively and with great success in the lower and medium grades of these products. Felt is another product which has attracted attention in recent years; its imports were reduced from 40 tons in

1929 to less than 30 in 1940, and it has, in addition, become an export product.

Nearly all of the woolen textile factories are located in the South or Southeast; São Paulo had 43 per cent of the total output of 6,560,000 meters in 1939, and Rio Grande do Sul, the largest producer of raw wool, was second in textiles with 27 per cent of the total. The Federal District had 24 per cent of the output in that year; next was Minas Gerais with but 4 per cent of the total and Estado do Rio, 2 per cent. The industry in São Paulo, though depending to a large degree upon the imported raw material like the Federal District, utilizes the domestic raw wool to a greater extent. The industry of Rio Grande do Sul in the extreme South depends principally upon the wool produced within the state and thus is one of the chief producers of strictly Brazilian woolen textiles; it also produces a great part of the woolen textiles which enter into coastwise trade.

Whereas the output of all other textiles has tended to increase, that of wool has remained relatively steady in recent years and approximates 6,500,000 meters annually. The price of the national product ranges from 25 to 70 milreis while the English-made cloth varies from 100 to 150 milreis per meter. The so-called tropical weave with synthetic fibers made in Brazil ranges from 50 to 60 milreis per meter while the English weave ranges from 100 to 120 milreis. Thus, with regard to price the domestic product has a wide advantage, but in quality the local product still falls short of the imported goods and despite the wide divergence in price, the latter still maintains a hold on some buyers. However, quality tends to be improved, first, with the mixture of proportions of foreign fibers and, secondly, with the general improvement realized in the industry; some types of serge equal the imported product. It is of interest to note in this regard the attempts to acclimatize the Angora goat to Brazil in order to produce its wool. Results have been promising,

and in recent years the output has approximated 800 tons. A continued development of this type of wool thus suggests another avenue of growth which may be ideally suited to Brazil, that of the production of the better grades of tropical weaves.

6. HEMP, JUTE, AND OTHERS

Despite the abundance of the soft and hard bast fibers in Brazil, the so-called hemp, jute, and others such as sisal and pita were not cultivated until recent years. Of these, possibly jute has registered the most interesting development, because it is a strictly Brazilian type of jute. It is being cultivated along the Amazon River near the border between Pará and Amazonas. Sisal is a still newer product and is grown in Sergipe in the Northeast and São Paulo in the Southeast. The 1941 crop was the first of any commercial significance. Hemp is now cultivated in the state of São Paulo by Japanese colonists, and the initial crop of 1941 was successful. Results of the tests of the technical characteristics should be known in the very near future. Thus, Brazil is physically able to supply a majority of the raw materials for the production of finished goods. It remains to achieve production on such a scale as to satisfy the domestic demand for cloths made from these fibers, which is of substantial proportions.

These fibers are largely turned into sacking and rope—the former being used for the heavy overseas exports of coffee and grains and the movement of sugar within the country. Until the 1920's, sacking and rope were largely imported; then sacks came to be made in the country from foreign raw material. Since 1939, there has been increased interest in reducing raw-material imports, and various mixtures of foreign fibers with Brazilian (principally caroá, piassava, guacima, and tucuma) have been attempted; but the greatest reduction has been realized by the substitution of cotton

sacks for jute and hemp. A secondary factor has been the increased tendency to ship grains in bulk. In addition, the Administration has authorized new sacks to be used a second time for some products for which unused sacks were hitherto required.

These fibers are also used for other coarse weaves, which in some cases approximate mats. However, it is in string, cordage, and rope that the second largest market for these fibers is found. Practically all the raw material for small cordage and rope is imported while that for fishlines, common string, heavy cordage, and marine hawsers is part domestic and part foreign. Consumption of these items within the country is insufficient to support an industry. In 1913, when the domestic string and cordage industry was almost nonexistent, the imports amounted to 660 tons—450 tons of hemp, 170 of cotton, and the rest of jute. Although exact data as to the domestic manufactures in this field in 1939 are unavailable it may be pointed out that imports had diminished to 50 tons, including 15 tons of cotton.

In the history of these fibers three representative years may be said to be 1913, 1925, and 1939. In 1913, 20,000 tons of raw jute and hemp were imported; in 1925, 22,500 tons; in 1939, 27,500 tons. In 1913, 940 tons of jute and hemp products were imported; in 1925, 1,370 tons; in 1939, 25 tons. It will be observed that the importation of manufactures has always been relatively small as compared to that of raw materials; it was of some importance in 1913 and 1925, but insignificant in 1939. These data also suggest certain fundamental changes that have occurred in the industry. Evidence of these is given by the following data which give an idea of the basic trend even if they do not cover the whole production field: production of jute and hemp textiles in 1913, 39,000,000 meters; in 1925, 70,000,000 meters; in 1939, 38,000,000 meters. By adding the output of sacks, one arrives at a fairly accurate conclusion, that the trend in this field

practically duplicates that in others: the imports of finished products have diminished with the growth of local industry; but it has brought an increase in the imports of the raw materials.

The state of São Paulo produced 76 per cent of the 1939 total of 38,000,000 meters of hemp and jute cloth. Pernambuco was second with an output of 3,880,000 meters, or 10 per cent. The others in order of importance were the Federal District, Rio Grande do Sul, and Bahia, which produced approximately 1,300,000 meters each. In the manufacture of sacks, São Paulo also led, with 64 per cent of the total, while the Federal District was second, with 16 per cent. Pernambuco, the third, produced 15 per cent of the total. The leadership of São Paulo is readily explained by the fact that this state is the largest producer of coffee and of grains which require sacking. For this reason the fact that the raw material is imported does not hamper it compared to the other states, and the same reason explains why the Federal District is also of significance in the industry. Pernambuco's importance rests entirely upon sugar, of which it is the largest producer. It also is favored by the fact that it is the largest industrial center of the Northeast and must supply a relatively larger market area.

It is difficult to guess what the future holds for this industry. Certainly, however, the production alone will continue to play an important part in deciding the trend which it will follow and this, in turn, depends largely upon the course of trade in the coffee, cacao, sugar, rice, and other industries.

7. EXPORTATION

One of the most expressive indexes of the progress attained in the domestic industry is the acceptance of its products in foreign markets in competition with similar products from the most highly industrialized countries. For Brazil, the four-

year period 1938-41 showed the following movement: 1938, 431 tons valued at 5,400 contos; 1939, 2,438 tons valued at 32,611 contos; 1940, 6,154 tons valued at 89,951 contos; 1941, 16,200 tons, valued at 317,000 contos. It is true that most of this output went to the South American markets, both east and west coasts; but in addition there is the factor of natural growth which has greatly increased the trade in familiar items and also brought about the shipment of new items hitherto not exported.

The principal manufactures exported are those of cotton: piece goods, 208,649 contos in 1941; spinning yarns, 12,782 contos; sewing thread, 6,014 contos; and unspecified items, 15,508 contos. Next in importance, rayon thread and yarn totaled 35,510 contos. Wool manufactures are third, and jute, fourth.

8. CONCLUSION

A salient feature of the fibers industry is the fact that all commercial fibers are grown in varying amounts in Brazil. Production of raw cotton has developed so far that in 1942 the country was the world's largest exporter. Of silk, Brazil is the only producer in the Americas; but it does not produce enough to fill domestic needs. Both wool and flax are produced in insufficient quantities. Hemp and jute are relatively new products. The former, though grown in some quantity, is still in the experimental stage. The latter began to be cultivated more than ten years ago with trial plantings to obtain a jute adapted to the Brazilian climate and soil, and it is only since 1937 that positive, concentrated production has been undertaken. Synthetic fibers such as rayon and staple fiber are also produced in Brazil, completing a list of fibers which is exceptional in numbers in world production and is probably unequaled. Thus, it is theoretically

possible to furnish all the raw materials for the spinning and weaving industry.

Although theoretically favored with fibers grown or made in Brazil, the manufacturing industry in most cases still depends on imported raw materials. Whether this situation is more or less favorable is open to question, as quality is also a factor not to be considered too lightly: in the case of wool, the lack of strict grading has lessened the benefits otherwise possible. The new legislation since 1939 in this field of grading has given a new aspect to raw material supplies in general in Brazil and, in the fibers, may provide the highly necessary and lasting benefits which have been attained with cotton.

In the meanwhile, the Brazilian textile and spinning industry tends to continue in its present line—substituting Brazilian products for imported manufactures, whether the raw material be national or foreign, and using a suitable national fiber instead of an imported fiber whenever this is possible.

With the war, the relation of the Brazilian spinning and weaving industry to the hemisphere economy becomes clearer: besides supplying certain fibers, Brazil may supply certain manufactures. Two outstanding examples follow. Cotton textiles, a great necessity at present in the United States, can be furnished in large quantities by Brazilian industry, if weaving equipment and machinery are imported. Jute products, principally gunny sacks or burlap, can be made in desired quantities if some of the Indian raw jute is diverted to Brazil. A significant development in Brazil is the increasing use of mixtures of Brazilian fibers in burlap manufacture, particularly *papóula* and *guacima*—a new possibility which no doubt could be profitably used to make good hemisphere shortages without material loss in quality.

IV

CLOTHING AND TABLE AND BED LINEN

1. GENERAL SURVEY

GROUPED in this chapter are two distinctly different types of goods, both of which, however, depend to some extent upon the textile and hide-and-skin industries. As might be expected, the table and bed linen industry supplies a demand which is highly similar to that in other parts of the world. However, under the classification of clothing one finds many similarities and many differences in Brazil due to the manner in which the clothing is used, or made.

Brazil is predominantly a country of immigrants, with little if any emigration of its citizens. Many of the everyday habits and customs are, therefore, from foreign lands, principally the Iberian Peninsula and the Mediterranean region, adapted to the climatically and ethnologically different zones of Brazil and gradually taking on permanent form.

In the North and Northeast, the local differences arose from the fact that these regions are, to a degree, "static" in economic growth, as compared to the more "dynamic" South and Southeast. The development, especially evident in the last two years, in the Northeast may thus be termed an "awakening" of the section to its own possibilities; and one of its most expressive indexes is in the industry of clothing.

As was mentioned in the chapter Spinning and Weaving, clothing must be manufactured for a moderate to warm climate, and the need is for cottons, hems and linens. This is

especially true in the North and the Northeast, where clothing in the lighter colors and the coarser fabrics is in favor. The "awakening" mentioned above is largely manifested in the growth of the industry which manufactures textiles of caroá, pacopaco, guacima, *papóula*, and *carrapicho*, all of which are local fibers easily spun and woven. Their natural light color, bordering on a grayish white and creamish yellow, makes them practical for everyday wear and for work, both in wearing qualities and in coolness. Whereas finely woven linen appears cool, clothes of the Brazilian fibers are cool. These textiles have the advantage of a moderate price along with their enduring qualities, and fit harmoniously into the economic level of that region.

Recently the use of clothes made of these Northeastern fibers has spread into the Southeast and the South with great rapidity and has made headway against linen from this important outlet. However, these fibers are not much used except in clothing. Thus, the manual laborer, who is one of the most important purchasers of the heavier and coarser working clothes, continues to use cotton shirts, varying from the thin white drills to the heavier duck. The pantaloons usually consist of the same unit of the oldest suit in his possession. The use of overalls or jackets and "jeans," common in the other industrial centers, is less widespread here, possibly because of their warmth and the greater freedom of movement with the Brazilian outfit. If the Brazilian fibers are to enter into competition in this field with a typical working uniform, a finer woven textile will have to be developed which is also durable. *Carrapicho* seems the most proximate to this goal.

Clothing the youth of Brazil in the school year is a different matter. Whereas the students of the United States rarely have a school uniform, the secondary schools of Brazil make the wearing of a uniform one of a regular practice, while the uniform is obligatory in some primary schools and

optional in others. In Brazil there is usually but one type of uniform for all seasons, drill.

It must be noted that the differences in suits are largely in the material. The styles adopted tend to remain within conservative limits, particularly in the case of the Brazilian. Modern sport styles have entered in but a limited degree, mostly in the tourist centers. This trend is found principally in the increasing use of blouses, sport shirts, and jackets—types of men's wear appropriate for the warmer climate. In women's wear, the principal change is in footwear, the sandal being most popular for the same reason.

As is mentioned in the chapter Leather, Brazil is a large producer of hides and leather, and manufactures excellent shoes and boots at relatively low prices. These products are available to all economic levels. Brazil is also a fairly large producer of rubber, and shoes with soles of this material are common on the market. Another fairly common sole material appears to be a mixture of rubber and cork, but is actually a light resilient material based on coffee. The upper part of the shoe is made from various materials, of which the most popular, other than common leather, is that of crocodile with its unique pattern. In fact, the manufacture of crocodile leather is of considerable importance, and the product has been introduced into innumerable nonindustrial fields where common leather is used.

No mention of footwear would be complete without a word on the so-called *tamancos* and their use in Brazil. These wooden clogs or sandals consist of a wooden sole, more or less the shape and form of the ordinary shoe. A single upper belt which forms an arch into which the toe is slipped consists of duck cloth or leather. Although scorned in many parts, it is most practical for work which takes the wearer into wet places and does much to reduce the practice of working barefooted, which is not only unhealthful but dangerous.

The output of the clothing industry in 1938 was valued at approximately 1,800,000 contos, ranking it third among the industries considered in this book. The output in 1940 is estimated at 2,000,000 contos. American methods of mass production have only quite recently been introduced in this field in Brazil. Despite the large output, clothing exports are low—slightly less than 400 contos in 1938 and 2,000 contos in 1940. In 1941, there was a substantial increase to 21,000. In the year of maximum exports, they amounted to but one-tenth of 1 per cent of the total output. This gives a rough indication of the size of the local market for these goods. Added to this are the imports, which annually range from 6,000 to 7,000 contos.

São Paulo has the largest production—more than 61 per cent of the total output in 1938. Three industries had outputs larger than 150,000 contos: footwear, 460,000 contos; sheets, towels, etc., nearly 180,000 contos; socks and stockings, 156,000 contos. This state has the largest tanning industry, as well as that of the largest manufacture of leather articles other than shoes—which explains the large footwear production in the Paulista State. The exact reverse of this is equally true—the large shoe and footwear industry explains the presence of a large tanning and leather articles industry. It is to be noted that the output of shoes in this state alone is larger than the total leather production of the Federal District, second in production. The Capital manufactured slightly more than 200,000 contos of these products in that year, or 11 per cent of the total. This compares with the 1,100,000 contos of São Paulo. Shoes were also the most important branch of activity in Rio de Janeiro, and were followed by shirts, pajamas, etc., the output of which was valued at approximately 39,000 contos. Hats, umbrellas, and canes were the third largest.

Rio Grande do Sul, the livestock state, also has a large shoe production, being, in fact, the second largest in that

industry. The global output of the state was 198,000 contos in 1938, and also represented 11 per cent of the total. This state is also second in the manufacture of ready-made clothes, which was the second most important product in this state. Minas Gerais, the fourth, produced approximately 111,500 contos of these articles, or 6 per cent of the national total. In this state also, footwear accounted for the major part of the state output. Pernambuco in the Northeast was fifth and produced approximately 54,000 contos, or 3 per cent of the domestic total. As was true in the other states, shoemaking also was the most important industry; the second industry was that of the manufacture of sheets, towels, etc.

2. BLANKETS, BED LINEN, AND BEDSPREADS

Among the items in this group, made of textiles, sheets, blankets, and bedspreads are most important, with a production in 1939 valued at 217,000 contos. São Paulo produced 78 per cent of the total; Pernambuco was second with 9 per cent, and Estado do Rio was third with 6 per cent. Minas Gerais and Rio Grande do Sul produced 4 per cent and 1 per cent, respectively. São Paulo's overwhelming leadership may be traced to its large cotton and woolen textile industry. Raw cotton is abundant in that state, while raw wool comes from Rio Grande do Sul and spun wool from abroad.

The only import statistics are of woolen blankets: 736 kilograms of these, valued at 41 contos, were imported in 1940. Bed linen, bedspreads, and towels, which were formerly classified separately, are now placed under the general heading "Not specified." This change from separate classification makes it reasonable to suppose there has been a considerable reduction in the imports.

3. TOWELS, NAPKINS, ETC.

São Paulo also leads in the production of towels, napkins, etc. Strangely enough, Alagoas in the Northeast, the second smallest state, formerly held the lead. Alagoas and most of the other states of the Northeast grow much fine quality long-staple cotton besides the regular medium to short staples, and thus have a firm base for the textile industry. The great increase in output in São Paulo after 1937, however, shifted the center of the industry to the South, and the rise of the state of Santa Catarina also played its part. These two states now lead in the industry, while Alagoas maintains the same level of production.

São Paulo produced 8,492,000 units, valued at 25,500 contos, in 1939, as compared to 3,944,000 units, valued at 11,800 contos, in 1938. Santa Catarina was second in 1939 with 5,515,000 units, Alagoas third with 3,736,000 units.

4. CLOTHING

The production of ready-made suits is exceedingly small, and the closest approach to an industry is the cutting and sewing of the cloth for the main part of the suit. Such suits are usually 10 to 15 per cent cheaper than suits which are entirely made to order. However, the made-to-order suit is most popular, the buyer selecting the material and delivering it to the tailor. Tailors' fees vary greatly through the country, and even through a single city. Probably the lowest fees are in the Northeast, where tailors customarily charge sixty to eighty milreis (three to four dollars, approximately), and the highest are in the Federal District, where the average ranges from one hundred twenty to one hundred fifty milreis (six to seven and a half dollars). In São Paulo, the second largest city of Brazil, the charges vary from ninety to one hundred thirty milreis.

The manufacture of pajamas, underwear, shirts, etc., centers in São Paulo, which had an output in 1939 of 9,400,000 units valued at 114,700 contos. The Federal District was second with 2,518,000 units valued at 28,200 contos, while Minas Gerais was third with more than 1,600,000 units valued at 14,200 contos. An interesting feature is the apparent tendency of production to center in São Paulo, which, until 1938, had never produced more than 45 per cent of the total output; but in 1939 its output increased to more than 65 per cent.

The making of overcoats, raincoats, manteaus, fur coats, etc., is concentrated in the South. The limited consumption keeps the production relatively small, and of the 700,000 units produced, in all nearly 524,000 were from Rio Grande do Sul, the southernmost state.

5. SOCKS AND STOCKINGS

São Paulo also leads in the making of socks and stockings, with more than 80 per cent of the national total in 1939 (more than 54,000,000 of the total of 68,180,000 pairs). Minas Gerais was second in 1939 with 6,432,000 pairs; Santa Catarina made 4,574,000 pairs; the Federal District, 1,733,000 pairs; and Rio Grande do Sul, 909,000 pairs. It will be observed that more than 99 per cent of the national total is manufactured in these five Federal units.

Imports have been reduced considerably in recent years—from 7,400 kilograms in 1926 to 890 kilograms in 1937 and 74 kilograms in 1940. This trend accompanies increasing imports of thread and yarn, which are made into hosiery in Brazil. Homemade fiber forms an overwhelming proportion of that used in the stockings and socks, but it is not uncommon to find among these some which are marked *fio estrangeiro* (foreign yarn).

6. HANDKERCHIEFS, NECKTIES, AND GLOVES

The manufacture of haberdashery, in general, had depended greatly upon the development of the spinning industry which, in turn, has been quick to grasp the methods of making the customary and the "new" in this line. An outstanding example is the manufacture in Brazil of neckties in various styles (tropical, Palm Beach, washable, etc.) and in the different fibers (among which the more common are silk, rayon, cotton, and wool). Tastes in color vary greatly, but in general there is an apparent leaning toward the conservative.

The annual production of the Federal District is approximately 2,155,000 ties valued at 13,000 contos, and São Paulo produces 1,100,000 ties worth approximately 5,300 contos. Rio Grande do Sul produces 500,000 ties with an approximate value of 2,700 contos. The total for all Brazil was 4,000,000 ties valued at 22,000 contos.

Handkerchief making has expanded to include many types, but still does not include linen and certain types of silk, for which the popular fibers have been lacking. Embroidery has advanced so that the foreign product, which formerly ruled the Brazilian market, has little superiority. Colored pieces are common, but unfortunately, from a strictly national viewpoint, the tendency is to copy foreign designs rather than to stress purely Brazilian combinations of colors and themes, which would not only appeal to tourists interested in souvenirs, but also make known the natural beauties and scenes of Brazil in all corners of the country, and of the world. The latter may, in general, be said to be one of the gravest faults in Brazilian industrial art, and no doubt contributes to the lack of knowledge of the country in foreign lands. (In all justice it would be necessary to exclude from this classification the perfectly designed arti-

cles of pine from southern Brazil, and the products utilizing the brilliant blue butterfly, *Morphos aega*, so common in southeastern Brazil.)

São Paulo is the principal center of handkerchief manufacture, and had an output in 1939 valued at 24,000 contos. Following the Paulista State is the Federal District with an output valued at only 4,000 contos. The outputs of Estado do Rio and Alagoas are valued at 500 to 600 contos annually. The national total for 1939 was over 20,000,000 units valued at 30,000 contos. The making of handkerchiefs too has gone largely to São Paulo because of the development of the spinning and weaving industry in that state.

In general, gloves have a limited sale in Brazil because of the warm climate; and they are little used in industry. Only with the style of net gloves for women has there opened a fairly extensive market in Brazil for gloves.

In 1939, five states were producing gloves, led by São Paulo with an output in 1938 valued at about 7,600 contos. The output of the Federal District was valued at 3,100 contos. Rio Grande do Sul, Paraná, and Pernambuco also make gloves.

The kid leather of Brazil is reputed in the industry to be the best in the world, besides being available in the largest quantities. Even with this advantage, Brazil has made no headway in the making of kid gloves. The greatest difficulties would seem to be in making the proper quality of leather from the hide.

7. COLLARS, GARTERS, SCARFS, FURS, ETC.

The making of collars has diminished considerably in recent years, since the so-called *camisa americana* (American shirt) with attached collar became popular. So rapid has been the shift that there are still many men who, accepting the change in types of collars, cling to cuffs made for cuff links

or buttons, and demand a shirt with an attached collar but cuffs made for links or buttons.

The Federal District made the most collars in 1939: 592,000 valued at 1,200 contos. São Paulo was second, making 260,200 collars valued at 560 contos.

The Federal District also leads in the manufacture of belts, supports, corsets, etc., with more than 74,600 in 1939 which were valued at 2,100 contos. In the same year, São Paulo produced 43,300 units (1,200 contos), while Estado do Rio made 1,430 units. Rio Grande do Sul was fourth. The total for the country was 122,800 units.

Although it is impossible to obtain statistics on the production of garters in Brazil, a large part of the output is from the states in the Southeast, particularly São Paulo and the Federal District.

Scarfs, shawls, furs, and similar items are made principally in São Paulo, which in 1939 had an output of 201,000 units, valued at 60,200 contos. Second was the Federal District with a production worth 7,900 contos, while Rio Grande do Sul was third with 5,700 contos. In volume of production, however, the Gaucho State outranked the Federal Capital, with 43,800 units against 25,600.

8. HATS, CANES, AND UMBRELLAS

Before turning to the economic aspects of the strange combination of products listed in this title, let us note that in the Portuguese language parasol is a *chapeo de sol* (sun hat), umbrella is *chapeo de chuva* (rain hat) or *guarda-chuva*, and an ordinary hat is *chapeo*. Parasols, umbrellas, and hats, therefore, are all *chapeos*.

Hats and canes have had a dwindling production in recent years, while umbrellas and parasols have shown a contrary movement. The decrease registered in hats is not in Brazil alone—especially in men's hats. The practice of going bare-

headed is increasing by leaps and bounds. An interesting aspect of this trend is that the diminution is accentuated in that of straw and Panama hats. Felt hats have also declined in popularity, and the manufacturers have been obliged to use their felt for other purposes, principally industrial. Statistics on hat production bear out the decline. In 1925 the Brazilian production was more than 7,110,000 hats, while in 1929 it had risen to 7,999,000. By 1937 the number had risen to 8,402,000, but then it began to fall to a level below that of ten to fifteen years ago. In 1938 the output was but 6,791,000, while in 1939 it was 6,875,000.

São Paulo is by far the largest producer, having made 4,675,000 hats in 1939, while the Federal District made 1,437,000. Following these were Rio Grande do Sul (483,000), Minas Gerais (101,000), and Paraná (50,000). The annual imports of felt are 30 to 35 tons; of manufactured felt hats, approximately 5,000; and of Panama or straw hats, 6,500.

A new type of hat which has been showing great popularity is made of caroá fiber. Besides being light and porous, it keeps its shape after long use and is cheap. It would not be surprising if this contributed to a general rise in the output of hats.

The production of women's hats is largely a home industry on which it is difficult to obtain statistics. Appearances point to an increased consumption. However, besides the general small use of women's hats in all classes, there is a general trend toward abandoning them in the lower levels, while in the more well-to-do groups there is a decided reduction in their use by the lower age groups.

9. FOOTWEAR

Many industries in Brazil could claim that their products were equal to the imported articles; but few enjoy the pres-

tige the shoe industry has earned, not only in the home market, but among foreign buyers. Several factors combine to assure this; among the more important are the long existence of the industry in Brazil, the strong competition of small shops which feature handmade products, the relatively large supply of numerous types of leather, and the exceedingly wide variety in taste of Brazilian buyers.

Tradition has played an important role in this industry. Although statistics to prove its early existence are lacking, Portuguese immigrants skilled in shoemaking by hand began to arrive soon after the discovery of Brazil in 1500. Contributing also to an early development was the growth of a relatively important hide and skin industry in colonial days, evidenced by the significant percentage these products accounted for in the exports.

The small shops with their handmade shoes continue to play an important part in the shoe trade by their stimulation to the constant improvement of the factory product. Shoes made by hand are only of the medium to higher grades and sell at prices no higher than those of equivalent factory products. Which calls to mind another fact about the factory product: a major part of the work on it is hand work. This tends to place the two methods of shoemaking on a level. Thus there is a continuous rivalry on the two sides competing on practically equal grounds which has stimulated initiative in shoe design, in combination of types of leather, in color, and in pattern. In the lower grades of shoes large-scale manufacture lends itself to the making of types bought not for appearance but for cheapness and ability to endure wear.

Probably the two reasons noted above—relatively large supplies and wide variety of tastes among the buyers—are in reality cause and effect, or vice versa. The first point is borne out by a casual glance at an ordinary Brazilian shoe shop. In soles one finds common leather, rubber, fibrous

materials, crepe, wood, a coffee-rubber mixture, cork-rubber mixtures, and fish leather. Heels are of leather, rubber, or wood, but the uppers show considerable variety, being made not only of ordinary leather, but of crocodile leather, snake-skin, kid, drill cloth, imitation leather, patent leather, and pigskin. The continued acceptance of all such types of shoes is a result of the great diversity of tastes of the Brazilian. Even where the same type of material is used for the upper, the variety of design and construction is extremely wide, including differences which arise from the combination of colors.

The national output varies from 38,000,000 to 44,000,000 pairs annually and is valued well over 800,000 contos. São Paulo is far in the lead, and in 1939 produced approximately half of the total output. Rio Grande do Sul is second with 8,900,000 pairs, or 20 per cent, while the Federal District is third with 5,000,000 pairs, or 12 per cent. Minas Gerais produced 3,000,000 pairs, or 7 per cent; and Pernambuco, 1,100,000 pairs, or 3 per cent. Although these five states produce about 90 per cent of the total, every state manufactures shoes; strangely enough, the output of Espírito Santo in the Southeast is the smallest.

The leadership of São Paulo in this industry is based on cheap labor and a relatively large number of skilled hands. The large local supply of leather is not so vital a factor as it was in early days, the present combination of domestic and foreign leathers, or other types of materials, having diminished its relative importance. Rio Grande do Sul, on the other hand, finds the presence of a large local supply an important factor, and as one of the largest livestock states of Brazil can always rely on near-by supplies. The third largest manufacturer, the Federal District, may be placed in the category of São Paulo, while the fourth, Minas Gerais, is similar in many respects to Rio Grande do Sul.

Importation of shoes of all types continues to some extent, and amounted to five tons in 1940; however, four tons of this were those of rubbers and galoshes. In 1928, the total imports amounted to as much as 41 tons, of which rubbers formed 33 tons. There has been a reduction of more than 85 per cent in these purchases. The relatively high percentage of rubber footwear still imported in spite of the fact that Brazil produces rubber and manufactures other excellent products of rubber is due to the prestige that certain foreign articles enjoy among immigrant groups.

In 1937, 42,000 pairs of riding boots were made, with a value of some 3,400 contos. Of this total Rio Grande do Sul made 24,500. São Paulo made more plain boots than any other state—more than 13,500,000 pairs in the national total of approximately 29,000,000.

Of slippers, sandals, etc., the national total is about 11,000,000 pairs; São Paulo made more than 4,700,000 pairs, and Rio Grande do Sul was second with 1,500,000 pairs. The output of tennis shoes in 1937 amounted to 2,580,000 pairs, including 2,300,000 from São Paulo and 27,000 from the Federal District.

10. LACE, RIBBON, ETC.

Lacemaking is disseminated throughout the country, and in some states has reached a high stage of development. Being a home industry, it has not been subject to taxation, and the actual volume of production is unknown. Fortaleza in Ceará is one of the principal distributing centers of handmade lace, and from this city a large part of the output of Ceará, Piauhy, and a part of that of Bahia reaches other centers. Secondary distributing centers in the Northeast are Maceió, Aracajú, and Recife.

Handmade lace commands high prices in the Federal Dis-

trict and São Paulo, at times as much as fifteen times the cost in the producing centers. In this product, there is a visible influence of the Dutch and Portuguese, expressed in the types called Renaissance, Milan, Flanders, Ireland, Madeira, and Teneriffe. It will be remembered that the Dutch long ruled part of the Northeast of Brazil and introduced many of their ideas and arts, which were developed to a high degree under a fairly long peaceful administration.

Without question, however, the output of handmade lace is small, as compared to that of machine lace by the large modern factories of São Paulo, the Federal District, and Estado do Rio. Output has now reached the stage where there are surpluses available for exportation. The national output exceeded 198 tons in 1938 but declined to 153 tons in 1939. Of the latter, São Paulo accounted for 74 tons; Estado do Rio, 54; the Federal District, 18; Santa Catarina, 7.

Brazil may also be said to be self-sufficient with regard to ribbon. The national production in 1938 totaled 441 tons with a value of 58,000 contos; in 1939, 378 tons valued at 50,000 contos. Of the latter year, Estado do Rio produced 144 tons; São Paulo, 116; the Federal District, 20; Santa Catarina, 15; and Paraná, 14. All these states are in the Southeast or extreme South of the country, where the dyeing, tinting, and textile industries are concentrated. A small importation still continues—to less than one-tenth of a ton, mostly made of silk and rayon.

11. THREAD AND BUTTONS

The button industry in Brazil has developed slowly, gradually displacing the former imports. The varieties of buttons still imported in quantity are mother-of-pearl, special

glass, imitation pearl, and special designs. Brazilian originality has also added some products of its own to the button industry, particularly by working novel designs with wood and the ivory nut.

In 1939, seven states had button industries, of which that of São Paulo with an output of 983 tons stands out in the national production of slightly more than 1,000 tons, valued at 11,000 contos. The Federal District produced only 50 tons, while Rio Grande do Sul, Santa Catarina, Pernambuco, Paraná, and Estado do Rio produced still less.

Small quantities of buttons are imported, and the exportation averages 10 to 12 tons annually. Included in these shipments are buttons made of imported mother-of-pearl.

The annual national output of thread is unknown; but São Paulo makes more than 3,800 tons, and it is reasonable to assume that the national total exceeds 4,000 tons. Rio Grande do Sul annually produces 95 to 100 tons, and Estado do Rio ranges from 90 to 95 tons (93 tons in 1939). Minas Gerais has an annual output of 40 to 50 tons, while that of the Federal District amounts to but 20 tons annually.

More than 200 tons of thread were exported in 1940, which indicates that the overseas sales approximate 5 per cent of the production.

12. EXPORTATION

In general, the exports of this classification of goods have been increasing annually: 29 tons in 1938, almost 35 tons in 1939, and more than 71 tons in 1940—in value, 373 contos, 486 contos, and 1,923 contos. In 1941, there was a substantial increase, the total being more than 21,000 contos. Footwear has long been the principal export product. Hats also enjoy wide prestige in foreign markets, as do umbrellas.

13. CONCLUSION

Probably one of the truest and yet falsest of statements is that the Latin American leads an "easy-going" life. It may be termed true in the sense that in some sections it is possible to revert to the standards of Columbian and Colonial days, with food easily obtainable, clothing simple and easily made, and shelter also easy to secure. The reduction of necessities to modest limits, then, always assures some degree of satisfaction. The raising of general standards, however, has created a more complex life which strains and distorts the economies of many Latin American countries in order to permit the satisfaction of new needs. Thus, in many cases, life in Latin America has become less "easy-going." Of all the countries in Central and South America, probably it is in Brazil that an "easy-going" life is most possible, since food supplies, even under the new standards of living, are still abundant while clothing is assured under the new oriented economy and shelter is not too difficult to obtain.

The struggle for improvement of food supplies in quantity and quality has offered no serious difficulties except in wheat. However, it is in clothing that the greatest "oriented" development has taken place; and it therefore merits special mention in this chapter.

Although Brazil is the sole producer of all types of commercial fibers in considerable quantities, it may be said of the standard fibers—cotton, wool, silk, linen, jute, rayon, and hemp—only cotton and, possibly, some wool were native to this land and obtainable in abundance from early days. Sericulture was unknown. Linen was, until recent years, an important import commodity. Jute was, and still is, to some extent, as are rayon and hemp. Since 1937, there has been a noticeable change resulting from a directed economy, which has stimulated sericulture through private action on the part of immigrants and government action

through the establishment of experimental stations, the growing of linen in the South through governmental and private factory assistance, jute growing in the Amazon valley by the Japanese colonists, the manufacture of rayon on an increasing scale, so that Brazil now ranks ninth or tenth in world production, and the culture of hemp in recent years in the Southeast. To these must be added the program of the "substitution of fibers" which was aimed at diminishing the use of those coarse fibers which continued to be imported and their displacement by national fibers of equivalent qualities. This latter program has attained surprising success, and has assured Brazil her "easy-going" life with regard to some types of clothing.

Close upon the heels of this development is that of the textile industry in Brazil, some branches of which are based upon a traditional background, and others advanced by the coming of foreign immigrants who established them; it has made available abundant supplies of the more common items of clothing and also some of the quality goods. True, the progress to date has been one of imitation rather than creation, but it has provided the Brazilian with Brazilian-made clothing and thus liberated him from the heavy dependence upon foreign sources which is characteristic of many countries, and, at the same time, kept pace with his rising demands based on an increasingly complex life so that his is a more "easy-going" life.

V

LEATHER *

1. GENERAL SURVEY

TANNING and the making of leather goods is one of the oldest industries in the country, noted in some of the first written reports on Colonial Brazil. As was true in the Plate region, the use of livestock and other animals was at first limited to the hide and skin. There was, in addition, an abundance of native plants which contained tannin and thus facilitated the early initiation of the tanning industry. By 1809, Brazil was a regular supplier of light, soft leather for linings to Italy. This, however, represented a small portion of the gross shipments of hide and skin products since many of these were dried and salted hides and skins, principally the dried product.

The Marquis of Lavradio, when Viceroy of Brazil from 1769 to 1779, wrote a voluminous report on its economic situation and alluded to the leather industry in the then province of Santa Catarina stressing the lack of salt in that region, which seriously handicapped the industry in the conservation of its hides. Further on, mentioning the defects in the incipient local butter and cheese industry, he wrote: "In the matter of livestock, there is another great inconsistency; first, when the livestock raisers wish to complete a lot of hides for shipment, they slaughter all the cattle indiscriminately whether they be cows, calves, or bulls, or still of an age in which they could not yield the greatest

* Excluding footwear (discussed in the chapter Clothing and Table and Bed Linen).

utility, the ratio of usefulness being diminished to one-half, at times." This naturally seriously diminished the herd of livestock and affected the quality of the hides. The Marquis also pointed out the disastrous consequences of this policy on the young livestock, which were at times deprived of food in their earlier months and thus grew to be weak stock. All this continues, he mentioned, despite the splendid examples furnished by the Spanish in the neighboring regions, their hides and skins being much larger, weighing more and therefore selling at a higher price.

It is of interest to note that some sections still cling to the methods of the days of the Marquis of Lavradio. However, in the greater part of the cattle country, twentieth century methods of cattle raising introduced by the Federal organs, the cooperatives, and the packing houses have resulted in an appreciable improvement and created important markets for the domestic salted and dried hides and skins.

Despite the fact that Brazil has the fourth largest herd of cattle in the world and that exports range from 50,000 to 60,000 tons annually, hides and skins are still imported for use as raw materials. They consist chiefly of prepared leather and furs, the 1940 amount being 190 tons. Principal imports are hatbands and such small leather articles as bill-folds, pouches, and purses. These totaled 69 tons in 1940. A decade and a half ago, the imports of hides and skins amounted to 1,090 tons, while manufactures totaled 240 tons, the former being approximately five times larger and the latter about three and a half times that of 1940. The substantial decreases in imports of the following leather products give a partial indication of the trend of the domestic leather industry: kid leather, shoes, leather belting, harness, and sole and upper leather.

São Paulo is the principal state in this industry. Its output in 1938 was estimated at 95,700 contos, or 36 per cent of the national total of 266,200 contos. Of the total of the

state, 53,000 contos was that of the tanning industry and the remaining amount of leather articles. About 60 per cent of the total leather tanned was cowhide. Other important hides and skins which are prepared are goat, pig, crocodile, and sheepskin. A relatively new product is the leather manufactured from *peixe-boi*, a large Amazon River fish with a hide which, when prepared, has a great affinity for coloring matter and thus facilitates the preparation of tinted hides. Nearly 20,000 tons of tanning material are consumed annually.

São Paulo's leadership is attributable to several factors, one of the principal being the fact that it has been the traditional slaughtering and packing center of Brazil. In the interior of the state, near Minas Gerais and Goiaz, both important cattle-raising states, is the city of Barretos which is a byword in the cattle industry. It has long been famous as a slaughtering and fattening center, and it is well situated with regard to the cattle trading routes of that section of Brazil. Another important factor has been the growth of the tanning industry in São Paulo. Despite the presence of numerous tannin-containing plants in Brazil, the commercial output of tannin is small and tanners must rely upon imports from Argentina (natural tannin) and Germany (artificial and chemical tannin). Thus, the industry grew up in the region which had the greatest contact with the outer world, Santos, for a long time, being the only port south of Rio de Janeiro equipped with facilities for overseas shipping.

Second in this industry is Minas Gerais, with an output of 50,700 contos, or approximately 19 per cent of the national total: 36,700 from the tanning industry and 14,000 from the leather articles group. Minas Gerais is also important in cattle raising and slaughtering. In addition, it raises considerable numbers of hogs for the bacon and the ham.

Following Minas Gerais is Rio Grande do Sul, in the extreme South, which is also a large packing center. However, despite the fact that the meat production in this center is as large as that of the two former mentioned states, the large exports of crude hides prevent the direct development of the leather industry. The output in 1938 amounted to 34,840 contos, or 13 per cent of the total. Approximately 24,900 contos of this total was from the tanning industry and the remainder from the leather articles industry. Other federal units of importance are the Federal District and Pernambuco whose outputs were 25,500 contos and 18,300 contos (10 per cent and 7 per cent of the total).

2. LEATHER ARTICLES

Formerly, the Federal District produced about half of the leather articles (excluding shoes) in Brazil, relying largely upon foreign raw materials which were already prepared and tanned. This is borne out by the fact that, of the total imports of prepared leather, 65 per cent were destined to the Federal District. The dominance of the Federal Capital in the leather articles industry continued well into the 1930's, but today the leadership has passed to São Paulo. Ahead of Rio de Janeiro also are the states of Minas Gerais and Rio Grande do Sul. São Paulo produces about 48 per cent of the Brazilian total, and Minas Gerais, 14 per cent.

Among the smaller producers, Paraná, Espírito Santo, Bahía, Pará, and Ceará are of some importance. These states make such articles as bags, trunks, purses, folds, brief cases, and belts.

3. RIDING EQUIPMENT AND SADDLES

There are various reasons why there should be a considerable domestic demand for riding and mounting equip-

ment and saddlery of all types. In the first place, Brazil ranks fourth in the number of horses; and if horses, donkeys, and mules are classed together as beasts of burden, Brazil ranks third. This means a heavy demand for leather equipment of one kind or another. The harness in use is simple and requires a relatively small amount of leather; but agriculture is not highly mechanized, and therefore more animals are needed to do the work. In addition, the lack of good roads in many parts of the country, and the backwardness of railway transportation, mean a heavy dependence upon animal power. The pack horse is a common sight in Brazil, and more common still is the pack donkey or mule.

São Paulo is the leading producer of saddles and riding equipment and in 1939 produced 50 per cent of the national total. Rio Grande do Sul was second with 21 per cent of the total, and Minas Gerais third with 18 per cent. Paraná produced 4 per cent, and Santa Catarina 2 per cent.

The principal articles produced are reins and girths; next in importance are saddles, and third, bridles, the first and third items having outputs of more than 1,000,000 units annually. The manufacture of saddles seems to have attained a stationary production of about 150,000 to 160,000 units annually. Of equal stability is the output of whips, which totals about 360,000 units per year.

4. TRUNKS, PURSES, BELTS, ETC.

The making of trunks, brief cases, purses, belts, etc., an industry long conducted by independent artisans, suddenly grew into one of medium-sized establishments in the last five years. This was largely due to the developing consumer preference for the product marked *Industria Brasileira* (Brazilian product) with a green consumption tax stamp, instead of *Marca estrangeira* (foreign brand) with a red con-

sumption tax stamp—a development influenced not only by the lower price of the domestic product but also by the great improvement in workmanship which took place along with the coming of quantity production. Today, articles in this group from abroad are bought as “unusual” presents or gifts.

São Paulo is the leading state in this field also—1,544,200 units valued at 26,600 contos, or 47 per cent of the total of 56,300 contos; although the Federal District produces more units (2,189,400), their value is only 11,700 contos, or 21 per cent of the total. Following the Capital are Rio Grande do Sul, Pernambuco, and Minas Gerais with 6,200, 2,700, and 1,600 contos respectively.

Of this group of articles, the principal products were bags, valises, cases, etc., and trunks and baskets were second. Of slightly less value was the output of billfolds, purses, bags, etc. Belts are fourth in importance and brief cases and albums are fifth. Except, possibly, crocodile and snake skin, practically all of the wild animal skins or hides are produced in Central, Northeastern, or Northern Brazil. Their development is promising, but the industry is not on a sound, rational basis nor is the trade organized to assure a reliable continuous supply of the abundant raw materials.

5. EXPORTATION

The exportation of semimanufactures and manufactures of hides and skins, although still small, has shown considerable growth in recent years, rising from 1,410 contos in 1938 to 2,430 contos in 1939, more than 5,980 contos in 1940 and 33,500 contos in 1941. Of the 1941 exports, sole leather valued at 21,300 contos was 64 per cent of the total and prepared hog hide valued at 3,800 contos was 11 per cent.

6. CONCLUSION

So far as the raw materials—hides and skins—are concerned, Brazil could be self-sufficient in this industry. The first deficiencies are in the processing of hides to make them industrially available.

As is well known, the business of the tanner is an extremely precarious one, particularly in a period of violent price changes, because tanning is a slow process and much time passes between the day he begins treating the hide and the day it is ready to be sold. In Brazil, tanning suffers from high interest rates, and only businesses which are thoroughly integrated can obtain a compensating rate. This condition has little basis in the tanning process. A second deficiency is in the tanning material. Brazil has large forests of quebracho in Mato Grosso along the Paraguay River, and the lumbering of this has developed to such a stage that it supplies at least half of the material needed; but the domestic tanning industry has grown to depend on synthetic tanning materials. Efforts to overcome this handicap continue and include the utilization of *mangue* bark, the importation of Paraguayan quebracho logs, and the trial cultivation of wattle bark. Each, though successful so far as it goes, fails to provide a satisfactory solution to the problem. The possibilities in the chemical industry of developing more suitable tanning materials have been under exploration for some time; and recently chrome salts (derived from the abundant ore in the state of Bahia) have received special attention.

In the actual manufacturing, Brazil is self-sufficient; and imports of manufactures are not continued from necessity. Footwear is treated fully in the chapter on Clothing; but here it may be noted that in this, possibly the most important, branch of the leather industry autarchy has advanced to the stage where unique Brazilian types and styles

have been developed and stand on a level with foreign products.

The contemporary trends indicate a bright future for the Brazilian leather industry through the wide possibilities in the domestic markets with the raising of per capita consumption of leather manufactures in fields which naturally belong to this product but which, in Brazil, have been occupied in many cases by impregnated textiles, rubber, and even wood.

VI

IRON AND STEEL AND METALLURGY

1. GENERAL SURVEY

THE working of iron dates from the earliest days of Colonial Brazil; but it was long held up by lack of fuel and of technicians. In 1874-75 there was no iron production in Brazil, and imports were insignificant, being surpassed in value by such products as cotton manufactures, beverages, wool manufactures, wheat flour, jerked beef, and linen.

At the beginning of the present century, however, the possibility of an iron and steel industry began to arouse public interest with the heavy increase in the domestic consumption of ferrous materials. From that time until 1914, the railway transportation system was greatly extended, and imports of rails alone averaged over 150,000 tons annually. By 1913, these purchases exceeded 260,000 tons and created a situation which was favorable to plans for the establishment of an iron and steel industry. A proposal made by foreign capitalists was studied by the President of the Republic, but the outbreak of the war prohibited its adoption at the time. Soon after the war the proposal of the Itabira Iron Company provoked lengthy discussion which ended with the decision that the contract was prejudicial to national interests.

It is only in the present administration that there has come a practical solution of the iron and steel problem on a large scale with the erection of the plant at Volta Re-

donda in Estado do Rio, approximately midway between the cities of Rio de Janeiro and São Paulo. The present project has already taken tangible form: the site has been selected and some buildings erected; the purchasing and commercial divisions have been established, the officers chosen, and the financial necessities already filled. Repeated notices of the guaranteed delivery of equipment by the United States, despite the pressure of war necessities, give double assurance to the realization of Brazil's great project.

In general, the iron and steel industry of Brazil depends on charcoal as a fuel, being situated close to the mines in heavily timbered country. It shows steady upward progress, specializing in certain types of iron and steel like the Swedish industry. The Companhia Siderúrgica Nacional of Volta Redonda, which is designed to use coke manufactured entirely from domestic coal, will, no doubt, solve its own fuel problem without creating difficulties for the plants already operating.

The present consumption of iron and steel products amounts to 405,800 tons, of which 144,000 tons, or 35 per cent, is produced in Brazil and 261,800 tons, or 65 per cent, is imported. The per capita consumption is thus nearly ten kilograms. The production consists of 100,000 tons of shapes, 29,000 tons of wire, and 15,000 tons of tubes. This total compares with an annual average production of 40,000 tons in all Brazil in the 1926-30 period and a consumption of 300,000 tons, or eight kilograms per capita. The Companhia Siderúrgica Nacional estimates the demand in 1950 at 560,000 to 600,000 tons. It is believed that the larger plants now operating will attain an output in 1950 of about 244,000 tons through natural growth and the smaller plants will produce 56,000 tons. On this basis, the Companhia Siderúrgica Nacional is expected to produce an additional 300,000 tons of shapes, rails, plates, tin plate, strips, etc.

Comparison of the sales prices of domestic iron and steel

products with those of imports shows that the Brazilian products are distinctly cheaper with the possible exception of tin plate, the import duties on which are relatively low. Iron bars are 57 per cent cheaper; rails, 15 per cent; plates, 20 per cent; and rods, 35 per cent. In order to make a fair comparison, 1937-39 was taken as a normal period and these prices were figured assuming that the steel plant was in operation.

2. MINAS GERAIS AND THE IRON AND STEEL INDUSTRY

Minas Gerais had an output in 1940 of 169,000 tons of pig iron, or approximately 91 per cent of the Brazilian total of 186,000 tons. It led also in the production of rolled iron (75,000 tons, or about 55 per cent of the national total of 135,000 tons) and steel (85,000 tons, or 60 per cent). In rolled iron and steel São Paulo and Estado do Rio also are important, the industry having been established in these states during the period in which the raw materials were imported. The ore from which pig iron is made is concentrated in Minas Gerais, which accounts for its great development there. In the national output of all forms of iron and steel, however, Minas Gerais still maintains a long lead with 65 per cent of the 1940 total, São Paulo producing 20 per cent and Estado do Rio 14 per cent. Santa Catarina and Rio Grande do Sul each produced less than 1 per cent of the national total.

The iron and steel industry has played a large part in the development of the metallurgical industry. Although, strictly, it may not be included within this, it is noted here for the sake of a complete panorama of the situation with regard to the latter. Together, their output today amounts to more than 1,500,000 contos, that of 1938 having been approximately 1,000,000 contos. For comparison, the exports of iron and steel and metallurgical products increased from

5,700 tons valued at 2,500 contos in 1938 to 61,400 tons in 1941 valued at 69,500 contos.

3. METALLURGY IN SÃO PAULO AND THE FEDERAL DISTRICT

The so-called "articles of iron, aluminum, copper, and other metals" subject to the consumption tax had an output of only 21,500 tons in 1928 as compared to 50,900 in 1938 and 52,300 in 1939. The 1938 and 1939 outputs were valued at 719,000 and 806,000 contos. In 1939 São Paulo produced 38 per cent of the total while the Federal District produced 27 per cent, Rio Grande do Sul 16 per cent, Minas Gerais 7 per cent, and Estado do Rio 4 per cent.

In São Paulo, the manufactures of this classification in 1938 totaled 333,400 contos, including: "articles of iron, aluminum, etc.," 186,000 contos; "cast and rolled iron and steel," 68,000 contos; small metal articles and parts, 40,000 contos; stoves and burners, 16,500 contos; and metal furniture, particularly iron, 15,000 contos.

As was mentioned, the Federal District is the second largest producer, her 1938 output of 333,100 contos including: "articles of iron, aluminum, etc.," 278,900 contos; "cast and rolled iron and steel," 16,000 contos; small metal articles and parts, 15,000 contos; burners and stoves, 8,500 contos; metal furniture, 7,100 contos.

"Articles of iron, aluminum, etc.," occupy a still more dominating position in the output of Rio Grande do Sul, the third largest producer—177,900 contos in the state total of 202,000 contos. Metal furniture and stoves and burners also are of some importance. Rio Grande do Sul produces little or no "cast and rolled iron and steel."

In the fourth largest producer, Minas Gerais, the leading manufactures of this description are "cast and rolled iron and steel," which might strictly be regarded as semimanufactures. There is no corresponding development in the

manufacture of finished goods, and so the state remains in a relatively backward economic position. Governor Benedito Valadares' plan to construct close to the state capital, Belo Horizonte, an industrial suburb with extremely cheap electric power rates (one of the main features of the industrial development of Estado do Rio, the Federal District, and the environs of the city of São Paulo), should bring an improvement in the state's economic position. To date, its high power rates have been the principal obstacle to the economic progress of the state.

Estado do Rio, situated near the Federal District, the second largest producer, has greater importance as a supplying than as a manufacturing state. Of its total output of 50,000 contos in this industry, "cast and rolled iron and steel" (semimanufactures amounted to 44,600 contos while "articles of iron, aluminum, etc." (manufactures) totaled but 4,800 contos. As in Minas Gerais, a cheap electric power supply has received serious study; and shortly a new high-power system will be in operation. An interesting feature of Estado do Rio's development in the future will be the large iron and steel plant of the Companhia Siderúrgica Nacional under construction at Volta Redonda, whose output is to include not only semimanufactures but also heavy, finished manufacturers.

4. ARTICLES OF TINNED AND ENAMELED IRON AND OF ALUMINUM

In this classification of goods, tinned or enameled iron and articles of aluminum were the leading products. In 1928 the output totaled 4,100 tons valued at 28,900 contos, while in 1937, the last year for which comparable statistics are available, it had risen to 16,000 tons with a value of 207,900 contos. In the latter year, the Federal District maintained the leadership in these articles with 50 per cent of the na-

tional total, while the state of São Paulo was second with 35 per cent and Rio Grande do Sul was third with 7 per cent. The high concentration of production in the Federal District and São Paulo results, in part, from the localization there of the iron and steel industry and the early start that they had in this branch of industry. Even in 1928 these two states produced as much as 98 per cent of the total. Minor producing states are Minas Gerais with 5 per cent, Pernambuco with 2 per cent, and Paraná, Estado do Rio, and Bahia with almost insignificant amounts.

5. HINGES, BOLTS, LOCKS, ETC.

Production figures for these articles are incomplete, and it is difficult to estimate the output. The national production of hinges in 1926, as revealed by the consumption tax, was 275 metric tons; in 1928, 1,200 tons; and in 1937, the most recent year for which data are available, 1,600 tons. The Federal District produced 900 tons in 1937; São Paulo, 300 tons; and Rio Grande do Sul, 240 tons. The output of hinges, locks, bolts, etc., together, amounted to approximately 1,000 tons in 1928, and 1,600 tons in 1938. The progress in this industry is equally striking as judged by the trend of imports: in 1928 imports of these items amounted to 1,900 tons; in 1939 the figure dropped to 740 tons, and in 1940 to 240 tons.

A similar change has taken place in screws, nails, rivets, and fasteners, of which 4,800 tons were imported in 1928, 365 tons in 1939, and only 310 tons in 1940. The latest production figures available are those of the 1938 Industrial Census, which make the total approximately 22,000 tons.

6. CUTLERY AND HARDWARE

Despite the long-standing preference for imported cutlery and hardware, the domestic products have gradually dis-

placed the imports, which have dropped from 900 tons of cutlery in 1913 to 540 in 1929, 110 in 1939, and 50 in 1940. The principal items still imported are spoons, knives, and scissors; all three of this group also are made in Brazil, and 700 kilograms were exported in 1939, 46,400 in 1940, and 61,000 in 1941.

The production of razor blades, practically all of which is concentrated in the Federal District, amounted to 823,000 dozen in 1939, including 812,300 dozen of the double-edged variety. São Paulo and Santa Catarina are far behind, with only 121 and 145 dozen respectively. Exports of these products were only 745 kilograms in 1940.

The production of cutlery and hardware is concentrated in the state of São Paulo. That state produces more than 2,000,000 shovels per year; but the output of picks, spades, etc., is unknown. An indication of increased manufacture is the decrease in imports from 10,200 tons in 1929 to 4,400 tons in 1939 and 2,800 tons in 1940. Confirming this trend is the increase in exports of cutlery and hardware from 6 tons in 1939 to 80 in 1940 and 85 in 1941.

7. WIRE

The production of wire, including barbed wire, amounts to about 29,000 tons annually, and the tendency toward an impressive increase in recent years is borne out by the decline in imports in the last three years: 1938, 83,300 tons; 1939, 49,600 tons; 1940, 27,900 tons. Domestic wire exports are noted in official statistics for the first time in 1940: iron wire, 1 ton; copper wire, 26 tons. In 1941 these rose to 1,420 tons and 253 tons.

8. STOVES AND BURNERS

In the making of stoves and burners, São Paulo is far ahead with 60 per cent of the total output in 1939. For

years Rio Grande do Sul led, having many immigrants familiar with that industry. Today the Gaucho State is in third place with but 15 per cent of the domestic output while the Federal District is second with 23 per cent. São Paulo produces 211,500 units; the Federal District, 81,600; and Rio Grande do Sul, 52,500. The trend in imports of this product emphasizes this development: 1913, 931.9 tons; 1938, 170.0; and 1940, 39.6.

9. FURNITURE AND FIXTURES OF IRON

One of the newer phases of this industry is the rising production of iron furniture and fixtures. São Paulo (50 per cent), the Federal District, and Rio Grande do Sul are the largest producers. The principal products are safes, document files, refrigerators, tables, chairs, and special fixtures for surgery, medicine, veterinary work, dentistry, etc. Of increasing importance is the manufacture of house furniture, particularly the modern style which is especially appealing in the tropical climate and in the many new multiple-story structures.

Imports of iron furniture and fixtures were 104 tons in 1928. Since then the utilization of such equipment has become widespread, and despite the heavy increase in consumption the imports were reduced to 76 tons in 1940.

10. ENAMELED IRONWARE

The principal Brazilian products in this group are bathroom fixtures, of which São Paulo has an annual output averaging 10,000 tons. Kitchenware is also produced in considerable and increasing volume, imports having been reduced despite the increased consumption. Aluminum ware provides serious competition, but this industry is still very new; and the appearance on the market of some inferior

products has temporarily prejudiced potential buyers against all such articles. The imports of enameled ironware have declined substantially as was mentioned, from 1,200 tons in 1929 to 60 in 1939 and 1940.

11. TINWARES AND TIN PLATE

In 1913, Brazil imported 573 tons of tin, including 136 tons in finished articles and 437 tons of raw or semimanufactured tin. Today, this trade presents a very different aspect: of the 920 tons total, 916 is raw and semimanufactured tin and only 4 tons is in finished articles—indicating the development of a manufacturing industry in Brazil. This increased production of finished articles in Brazil has a healthy effect not only on the industrial structure of the nation but also on the consuming market inasmuch as the cost of the raw material, as a rule, is proportionately less than that of the imported finished article.

A salient feature of Brazil's import trade from the early part of this century has been the relatively large purchases of tin plate. This consistently high demand may be traced in part to peculiarities in consumers' tastes; one important factor is the long use of tin containers instead of glass—the glass industry having been late in developing in Brazil. The demand of the fruit and meat canning industry has made for large sales of this metal; but in Brazil little fruit is canned except the highly sweetened *goiabada* (guava jelly), which is exceedingly popular in the daily diet. The demand for the other fruits is limited to the fresh fruit, and in that form they are abundant in all parts of the country through most of the year. With the limitation of the supply of tin in the present war, several plans have been formulated to reduce the consumption of tin plate—one of the most reasonable proposing the use of paper containers for

many of the more common purposes, and terneplate for non-edible products.

Despite the long dependence upon imports of tin plate no concrete, large-scale efforts have been made for the manufacture of that product in Brazil; there are strong current rumors that North American and Brazilian capital are highly interested in such a venture. A source in the near future will also be the Companhia Siderúrgica Nacional, whose projected scheme of production calls for the manufacture of approximately 50,000 tons of tin plate annually. Laminacão Nacional de Metais has also acquired enough secondhand equipment in the United States to produce yearly 20,000 tons of tin plate or terneplate in São Paulo.

Although Brazil has deposits of tin, their true economic value is still unknown. If they are uneconomical there is always the large source of supply in the neighboring Bolivia.

Most of the tin-plate products, principally cans, come from São Paulo, the Federal District, Minas Gerais, Pernambuco, and Rio Grande do Sul. Imports of tin-plate products continue, despite the reductions made, and totaled 26 metric tons in 1939 and 20 in 1940.

12. ALUMINUM WARE

The raw material of aluminum, bauxite, is produced in increasingly large quantities in Brazil; but the reduction of the ore for the manufacture of aluminum has not taken place there yet, although plans have already been projected for setting up two plants—one in the city of Ouro Preto in Minas Gerais and the other in São Paulo. The financial aspects of the problem have already been settled. Actually the only use made of the bauxite in Brazil is for the manufacture of aluminum sulphate.

In 1913, when aluminum was beginning to gain popularity, the Brazilian imports of the finished articles totaled 45 tons; in 1930, these imports had increased to 510 tons. Despite the enormous rise in use of aluminum since that year the imports of the finished products were reduced considerably and in 1939 totaled but 61 metric tons. The imports of 1940 were exactly double that of 1939. Contrasted to this trend is that in the imports of raw material, that is, bar, sheet, and wire: 1920, 136 metric tons; 1925, 305; 1930, 520; 1935, 1,106; and 1940, 1,638 metric tons. This bears out the increasing tendency to import the raw material instead of the manufactures. The output of national industry is approximately 1,500 tons annually.

13. COPPER WARE

The manufacture of copper ware is one of the more important branches of the metallurgical industry in Brazil today, and is concentrated in São Paulo. Other states also have promising industries, but their output is far behind that of São Paulo.

Some of the raw material used in industry is produced in Brazil, but an overwhelmingly large part is imported in bar, rod, sheet, or other form—nine to ten thousand tons annually. The imports of 1940 declined, with the difficulties brought on by the war, to eight thousand tons. Imports of the manufactures in 1940 amounted to 850 tons, including: tubes, 3,700 contos; adornment and jewelry for personal use, 2,400 contos; faucets, meters, and valves, 2,300 contos; and accessories for machinery for sugar manufacture, 2,000 contos.

The raw-copper supply is expected to improve greatly during 1943, as the copper deposits of Rio Grande do Sul are to be intensively exploited. For this purpose a complete refinery has just been bought from Uruguay.

14. ARTICLES OF LEAD

Brazilian imports of lead in sheets, plates, or ingots also have been showing a distinct increase: 4,600 tons in 1920; over 6,600 tons in 1928; and nearly 11,000 tons in 1939. There was a slight decrease in 1940 to 9,400 tons due to the difficulties in obtaining supplies. The importation of lead manufactures, on the other hand, has been steadily decreasing.

Brazil is an exporter of lead ore—nearly 1,000 tons in 1939. In 1940, there was an abrupt decline to 296 tons with the coming into fuller operation of the state-operated concentration plant, Usina de Chumbo e Prata, set up by São Paulo. In 1941, there were no exports of the ore.

A recent development is the organization, in the state of Paraná, of the Plumbum, S.A., which has started large-scale operations in the field.

15. EXPORTATION

As was mentioned above, the exports of articles grouped in the iron and steel and metallurgical industry in 1938 totaled 5,740 tons valued at 2,500 contos; in 1939, 24,300 tons worth 10,000 contos; in 1940 it was 31,000 tons valued at 28,500 contos; in 1941, 61,400 tons valued at 69,500 contos. Within this group, the so-called semimanufactures, pig iron, cast iron, iron plates, ferronickel, steel bars, brass and other copper alloys represented approximately 80 per cent of the total in 1941, and only 30 per cent in 1938. The remaining 20 per cent in 1941 consisted of the finished goods, principally iron tubing, wire, objects of silver plate, locks, bolts, knives, utensils, and chrome- or nickel-plated objects. In 1939, there were but thirteen types of manufactures exported while in 1941 this had increased to more than thirty, which also suggests the diversification under-

gone in this industry and practically all industries in Brazil today.

16. CONCLUSION

In conclusion, the general tendency in this industry today is to import the raw material and manufacture the finished goods in Brazil rather than purchase the latter overseas. The beneficial effects of such a procedure are sufficiently clear; in the case of Brazil, another important feature should be noted—the strong trend toward the utilization of this basic development to diversify production to a higher degree in all related branches.

Although the metallurgical industry is concentrated in São Paulo, the Federal District, and Rio Grande do Sul, because of the present dependence on imported raw material, with the utilization of domestic raw materials on a larger scale, the centers of metallurgy have shown a slight but perceptible tendency to shift closer to the mining centers in order to escape the transportation difficulties within the country.

With the war Brazil finds a shortage in certain types of iron and steel products since they have not been produced as yet in Brazil. Attempts to limit exports would be without effect on the problem as a whole inasmuch as they consist principally of the more common items such as pig iron, bars, and sheets, while the domestic necessities consist principally of rails and track material, plates, structural shapes, tin plate, steel strips, wire, and pipes. Facilities are now being created to produce rails, meeting 50 per cent of the normal Brazilian requirements. The rails will be of the twenty-five-pound type, the manufacture of which depends only on the receipt by Belgo-Mineira, S.A., of certain materials ordered from the United States. Laminacão Nacional de Metais, another big concern in Brazil, is installing in São

Paulo facilities for the production of plates, sheets, steel strips, and tubes.

These developments will put Brazil in a position to supply not only an appreciable percentage of her own needs but some other South American countries, thus relieving the United States of many of its supply and transportation difficulties.

VII

MACHINERY, APPARATUS, AND INSTRUMENTS

1. GENERAL SURVEY

IT IS possible to divide the development of the domestic machinery, apparatus, and instruments industry into three periods. The first period commences with the first days of Colonial Brazil and extends through the abolition of slavery (1888) to the closing years of the nineteenth century; the second reaches from the last years of the nineteenth century to the Coffee Crisis of 1929; and the third begins with the Vargas Administration in 1930 and continues to the present.

In the first period, the economy of the country was based on agriculture; little if any attention was given to machinery, tools, and instrument manufacture, human labor being preferred to that of the machine. In 1874-75, the year which marks the most prosperous period of the Empire, the imports of machinery and tools ranked sixteenth and were valued at 2,700 contos—only about half as much as the butter and cheese imports of that year.

Following the first period, various complex and inter-related factors brought about a slight growth in industry. Outstanding among these were: first, the rise of coffee production, which created a demand for Brazilian machinery; secondly, the coming from Europe of large bodies of immigrants who, with their mechanical skill and knowledge, added greatly to the material progress of the country; and thirdly, the growing importance in Brazilian agriculture of the cereals, principally rice. Other factors of importance were the extension and improvement of the transportation

system, and the abolition of forced labor. This period was rather one of increased *use* of machinery, tools, and instruments than one of increased *production*: the imports of these far outstripped the output of Brazilian manufacturers. By 1907, these imports had increased so that they ranked third, instead of sixteenth as in 1874-75. The 1914-18 war interrupted the importation of many types of machinery and forced Brazilian industry to stand on its own feet, with the result that the machinery and metallurgical industries of Brazil made progress which was exceedingly encouraging. However, in the postwar years, high prices and large exports of coffee created large foreign balances which in turn led to the purchase of foreign equipment, reacting unfavorably on Brazilian industry because of the better quality and lower price of imported products.

The Revolution of 1930, by which the Vargas Administration rose to power, followed shortly after the Coffee Crisis; and with the subsequent scarcity of foreign exchange Brazil was forced to rely upon Brazil once again. However, the emphasis in the earlier years of the present regime, evidence of which still remains, was that producers' goods rather than consumers' goods should be imported, in order to encourage manufacture of the latter in Brazil. Industrial Brazil of that day reflected this policy. Production of "goods to manufacture other goods" at first was small when compared to that of the "goods for immediate consumption." A new trend, tangible evidence of which was the appearance of the mark "Industria Brasileira" (free translation, "Product of Brazilian Industry") on much of the lighter equipment and machinery, modified the composition of Brazilian imports, diminishing the importance among them of the lighter production goods and increasing that of the heavy machinery, precision tools, and complex mechanisms. Today, imports of the latter type of goods lead all others in importance in Brazil.

The increased importation of production goods is accompanied by a natural and general rise in domestic production of all classes of goods. In 1938, the national output of machines, apparatus, and instruments totaled approximately 335,000 contos; in 1939, it was valued at 414,000 contos; and it is estimated for 1940 at 440,000. Of the 1938 output, 71 per cent, or 238,000 contos, was manufactured in the state of São Paulo; 70,000 contos, or 21 per cent, was from the Federal District; and Rio Grande do Sul with 11,000 contos was third. Others of importance were the states of Paraná (4,000 contos) and Minas Gerais (3,800 contos). An interesting detail is that the electrical industry is the dominating branch in the two leading states, São Paulo and the Federal District, while agricultural or industrial machinery and equipment is of secondary importance. The other states are agricultural, and have made greater advances in the manufacture of agricultural and industrial machinery. In the northern part of the country, the chief center of production is Recife in Pernambuco; others of some importance are Belém in Pará and São Salvador in Bahia.

2. RELATION TO DOMESTIC METALLURGICAL PRODUCTION

The trends in the importation of machinery, tools, and apparatus have also been evident in the overseas purchases of iron and steel, principally the manufactures of the latter. In 1874-75, iron and steel were ninth among imports, being surpassed in value by raw cotton and its manufactures, beverages, raw wool and its manufactures, jerked beef, wheat flour, linen manufactures, gold and other precious metals, and coal. Among these, coal alone is of importance in the import trade today; the value of beverages alone amounted to more than three times that of iron and steel, while that of raw cotton and its manufactures was nine times as much.

A little more than three decades later, in 1907, iron and steel had risen from ninth to second among imports—from 5,400 contos to 75,300 contos. Evidently the demand for such manufactures had grown substantially; and the annual growth up to the World War of 1914–18 became during the war a double-edged sword, making felt on one side a sharp deficiency in the machinery and metal manufactures market while on the other side giving a phenomenal impetus to the nascent national industry.

Today the imports of iron and steel approximate 620,000 contos, second to those of machinery, tools, and apparatus (more than 740,000 contos). In this transition the increased importation of both categories of goods demonstrates the greater demand for foreign goods. On the domestic demand for such goods there are few statistics; in their absence it is to be noted that, while imports of the crude and less complicated mechanisms have gradually decreased, there has been a corresponding or larger increase in imports of the more complex types, as was mentioned above. In many fields, typically Brazilian conditions have brought forth Brazilian ingenuity to solve the problems; and one notes special machinery for these products mostly of the tropical zone.

3. AGRICULTURAL MACHINERY AND IMPLEMENTS

The first machine manufacturing on modern lines was that for the processing of coffee and the milling of rice. The MacHardy Company of Campinas in São Paulo became famous in coffee circles for its processing equipment, because it was so practical, so reasonable in price, and so adaptable even to the middle-sized farms which had been unable to buy such machinery from overseas. Another firm of importance, and a pioneer in this industry, was the Companhia Lidgerwood. Today the plants manufacturing simi-

lar equipment are numerous and are located not only in São Paulo but through most of the coffee zone of Brazil.

This industry has undertaken the manufacture of equipment to industrialize other Brazilian crops, the most important of which, so far, are cotton and manioc (cassava root). Manioc brought about the manufacture of milling apparatus some of which today is among the most modern powered by electricity.

In order to complete a 100 per cent agricultural machinery and equipment industry, there still remains, it may be said, only the manufacture of tractors, special dairy apparatus, and pumping equipment. The ginning machinery for cotton is of Brazilian make; disc plows, planting equipment, threshing machinery, harvesters, etc., are also made in Brazil.

4. INDUSTRIAL MACHINERY AND EQUIPMENT

Just prior to the World War of 1914-18, the industrial production of Brazil amounted to approximately 1,000,000 contos; just after the war, it was estimated to be about 3,000,000 contos. A decade later, the industrial output had increased to 4,700,000 contos while in 1940, a decade later still, the value is placed at 25,000,000 contos—twenty-five times that of the first period, more than eight times that of the second, and more than five times that of the year in which President Vargas began his administration. In order to accommodate this increased output, huge quantities of industrial equipment and machinery were imported and in the earlier years practically all of the output was based on the use of foreign-made machinery for Brazilian products. However, in recent years, a transformation has come over this industry, and not only is the foreign machinery instrumental in this huge gain in output but also the domestic—especially light machinery and equipment.

Lathes are manufactured in São Paulo and Santa Catarina, the latter specializing in those for woodwork, for which it has large supplies of timber, especially pine. Drills, presses, and cutters are made by several firms in the state of São Paulo as are hand saws, blades, and mechanical saws. Santa Catarina also produces the latter. Several firms specialize in the foundry work for these products; but it is also common to find the work executed on a small scale in the factory itself.

The progress in the manufacture of pumps is well illustrated in the decline in imports; these were 1,300 tons in 1931, 200 tons in 1939, and only 17 tons in 1940. Bromberg & Company, Sociedade Técnica Bremensis, and Companhia Mecânica e Importadora of the state of São Paulo produce pumps and air compressors. Visitors to Brazil note the absence of windmills in the interior. This may be explained in part by the abundance of underground water and its proximity to the surface, which permits the continued use of the traditional wells, and in part by the relatively large number of surface water supplies—small creeks, ditches, rivers. Dry farming is also carried out with specific products which, in general, are favored by a well distributed rainfall in the upland plains west of the coast range of mountains.

The imports of boilers in 1913 amounted to over 3,000 tons; in 1928 they had decreased to 2,000 tons, in 1939 to less than 1,000 tons, and in 1940 to 670 tons. This reduction may be traced in part to the progress of the manufacturing industry in Brazil, principally in the state of São Paulo, which not only is making good the reduction in imports but has met the additional demand created by the rising industrial needs of the country. However, it is important to note that Brazilian production of petroleum is not yet of any importance, the industry having been initiated in 1939; and though there are fairly large deposits of coal, it does not compare, on the whole, with the better known foreign coals, large quantities of which are imported. This fuel problem

naturally retards the boiler industry in several fields and causes it to look with favor on the development of hydro-electric power. Brazil ranks sixth in the world in hydro-electric possibilities. Locomotive boilers of several railroad lines have been adapted to the characteristics of Brazilian coal so as to obtain the maximum calorific power from its use.

Other products of this industry which are of some importance are winches, elevators, conveyor lines, hoists, scoops, pile drivers, and other construction equipment. Among the more important producers, most of which are located in the state of São Paulo, are the establishments of Mecânica e Importadora, Cyclope, S.A., Mecânica Nacional e Máquinas Piratininga, Mecânica Nacional, and Lidgerwood do Brasil.

Facilities recently completed by the Brazilian Skoda and by Codic are ready to increase easily by 100 per cent, with locally produced materials, the alcohol distilleries in existence in Brazil.

5. TEXTILE MACHINERY AND EQUIPMENT

Brazil is perhaps the only world producer of all commercial fibers; and yet, for many years, the spinning and weaving industry failed to live up to the possibilities which the abundant raw material offered. Textile manufactures continued to be imported rather than produced within the country. Beginning a little before 1930, the industry made astonishing progress in nearly all fields, at first spinning or weaving textiles from foreign thread and yarn, and later making its own thread and yarn. True, the manufactures and yarn continue to enter into the country; but the amounts are gradually diminishing with the years.

The manufacture of equipment and machinery for this industry, although encouraging, cannot yet satisfy either

the bulk needs or the technical demands of the large textile industry. Therefore the equipment and machinery continue to be imported in large quantities. This is true despite the existence in the state of São Paulo of factories which are capable of meeting in quality most of the needs of the industry—in fact, this branch of manufacturing of machinery is one of the largest in that state. The demands for equipment in the industry are based largely on the fact that it is antiquated and does not give an efficiency coefficient which would favor both a more dominant control in the domestic textile market and a sharp inroad into foreign consuming centers. The problem is thus rather one of remodeling than one of opening new sources.

6. ELECTRICAL APPARATUS AND ACCESSORIES

The electrical apparatus manufacturing industry is relatively new in Brazil and was initiated in the state of São Paulo in 1926 with an output of but 2,700 units valued at 405 contos. Progress was slow in the earlier years, and the industry advanced rapidly only after 1937, from 50,000 units to 169,000 units in 1938, and 340,000 in 1939 (the corresponding values were 2,400 contos, 10,100 contos, and 20,400 contos). São Paulo led in production until 1938; but in 1939 the leadership passed to the Federal District, with 57 per cent of the national output to the Paulista State's 40 per cent. Rio Grande do Sul was third with 2 per cent, and Paraná and Minas Gerais together had 1 per cent.

Progress in this field is concentrated in the smaller apparatus and parts although some has been noted in motors and transformers. The imports of electric motors in 1913 exceeded 1,500 tons, and in 1924 rose to 2,200 tons. Imports of these were reduced to 890 tons in 1939 and 610 tons in 1940. Radio is also manifesting noteworthy progress, and several Brazilian manufacturers have placed quality

products in the market, combining national and foreign-made parts.

One of the oldest branches of this industry is, strangely enough, the manufacture of incandescent lamps, of which the General Electric plant is the only one in existence in Latin America. The earliest data are for 1921, when the output amounted to 690,000 lamps. Batteries began to be made that year—90 in all. The Federal District was the only producer of lamps; São Paulo led in batteries, and the Federal District was second. Now more than 14,000,000 lamps are made annually, two-thirds by the Federal District and one-third by the state of São Paulo. The quality and the low price of the domestic product have definitely reduced the market for lamps from Germany, Japan, and the Scandinavian countries. Notwithstanding this basic development, the public has not been aroused to demand electric light in Brazil (except in the newly constructed multiple story structures or small homes) to the degree to which it has been in many countries; and this provides room for expansion in the demand for electric lamps in the urban districts. However, it is principally with the electrification of the rural zones that the saturation point may be evaded. The vast electrification program of the Administration should open new outlets for domestic manufacturers, and many of these works are already nearing completion.

The total consumption of incandescent lamps in South America is 36,000,000 units. With the new General Electric factory now under construction, which is to produce another 10,000,000, the total needs of Brazil will be met as well as part of those of the other Latin American countries.

Batteries are made only in four states—among them, surprisingly, Amazonas. São Paulo produces 53 per cent of the national total (104,200 out of 214,700 batteries in 1939). The second is Estado do Rio with 42 per cent so that the two

states produce about 95 per cent of the total. Amazonas is third, and the fourth is Rio Grande do Sul.

7. BALANCES AND SCALES

Among the precision instruments which Brazil manufactures, the most outstanding is balances. The principal manufacturers, the Hobart Dayton Co. and the Filizola firm, satisfy practically all the internal demand and even export some of their products to Argentina, Chile, and Uruguay. Historically, the development of this industry is clearly indicated in the reduction of imports from 640 tons in 1913 to 404 tons in 1928 and 97 tons in 1939. Imports for 1940 fell to 84 tons, and most of these were delicate instruments and heavy capacity scales.

8. EXPORTATION

Besides the expressive indices of rising production contained in the import figures, there are clear indications in the exports which totaled 1,200 contos in 1938, 2,400 contos in 1939, 6,700 contos in 1940, and 17,100 contos in 1941. Although significant progress was registered in the exports of electric installations and parts (practically 2,400 contos), the greater part of the gain was in the increased number of manufactures exported.

The electric manufactures group provided most of the exports; and besides the electric parts, products such as electric lamps, X-ray apparatus, accessories, and electrotechnical equipment were exported. Industrial equipment and machinery are also of importance, the principal items in the overseas sales being wood and metal working machinery and textile industry equipment. Balances were also of some significance, being fourth in 1941 but second in 1939. The

chief remaining products are: refrigerators; hydraulic presses and pumps; motors; surgery, odontology, and veterinary apparatus; agricultural machinery; and hardware and cutlery.

9. CONCLUSION

The machinery, apparatus, and instruments industry in Brazil may still be considered as in its nascent stage. Of the raw materials necessary for the manufacture of such products, the domestic iron and steel industry provides substantial amounts, while supplies of the other metals and steel alloy metals are not wanting. The principal problem is their exploitation, with the small number of casting and foundry shops and the small number of metallurgists, due to the long-existing lack of interest in this field. As to workmanship in the more delicate tasks and in the manufacture of precision instruments, various examples of such work are evident in the country and leave little cause for apprehension. Thus, a bird's-eye view of the industry impresses one with the lack of harmonious development, which, rather than being a fault, is to be characterized as an overexpansion in output in certain sectors.

An interesting overnight development growing out of the abnormal conditions created by the war is the large increase in exports of certain types of machinery, which has necessitated official regulation of shipments through export licenses. In general, liberal exportation is permitted of products for which domestic demand is satisfied by national manufacturers.

VIII

ROLLING STOCK AND VEHICLES AND NAVAL CONSTRUCTION

1. GENERAL SURVEY

IT IS difficult to ascertain the exact value of the production of rolling stock and vehicles and naval construction in Brazil. One reason for this is that the repair and the construction of these units are done almost exclusively in the shops of the large transportation industries, and the products are not offered in the market. Another reason is that throughout the country, particularly in the hinterland, many shops undertake the construction and repair of carts and wagons for which production data are unobtainable.

In 1938, the large-scale industries in this classification had a production valued at 245,000 contos excluding the output of the docks of Mocanguê, Conceição and Ladário of the largest navigation company in Brazil, Lloyd Brasiléiro. The output of this limited group of enterprises, in 1939, was valued at 296,000 contos. Among the states, São Paulo is far in the lead with an output of 121,000 contos in 1938 due largely to the high degree to which the construction and repair of rolling stock and railway equipment have developed. Estado do Rio with its large dockyards is the second among Brazilian states. Its output in 1938 was estimated at more than 40,000 contos (including 18,000 contos repair of vehicles), besides the output of the Mocanguê docks. In third place, the state of Minas Gerais depends largely upon the repair of vehicles for its total of 21,000 contos in 1938.

2. LOCOMOTIVES

Practically all the locomotives in Brazil are of foreign make. Only recently the first electric locomotive in Brazil, and in South America, was constructed in the shops of the Estrada de Ferro Central do Brasil (Central Railroad of Brazil) at Engenho de Dentro in the Federal District. Financial credit has already been extended for the construction of six similar units which are to be used principally for freight and yard service.

Steam locomotives have been constructed since 1911, the pioneer in this field being the Companhia Mogiana de Estrada de Ferro of the state of São Paulo. Construction of various types went on until 1922, when work was discontinued for seventeen years. In 1938, work was resumed with the construction of three powerful locomotives known as Consolidation, Type 2-8-0, for freight service. The Consolidation series, as well as the units of former years, were constructed by Brazilian engineers and workers.

The Companhia Paulista de Estrada de Ferro and the Estrada de Ferro Sorocabana have also constructed locomotives, and have recently enlarged the capacity of their shops, which should greatly facilitate operations in future years.

3. PASSENGER AND FREIGHT CARS

Most of the railroads of Brazil are constructing their own passenger cars, the more common being the wooden body type. The larger part of the metal cars must be imported. In 1934, the Companhia Paulista de Estrada de Ferro constructed, for experimental purposes, two restaurant cars made of steel. The same concern is working now on several kinds of steel cars. Freight cars have been made in Brazil almost in their totality for a period of years, there being establishments which specialize in this work. The largest

among these are the Pullman Corporation, Companhia Sorocabana de Material Ferroviario, Companhia de Santa Matilde e Companhia de Comercio de Construções. The Companhia de Material Ferroviario is located in São Paulo; the Companhia Santa Matilde in Lafayette (state of Minas Gerais); and the others in Rio de Janeiro.

These companies have also recently initiated the construction of tank cars for alcohol and cottonseed oil.

It may be noted, in addition, that all the streetcars and trams are constructed in the shops of the traction companies. The importance of this type of transportation is illustrated by the fact that in the Federal District alone the total movement of passengers is over 500,000,000 per year and thus demands a well organized upkeep service.

A small railway line known as the Marica was the first to construct an internal combustion locomotive in Brazil, and opened a new industry which, to all appearances, has a very promising future. The Companhia Mogiana de Estrada de Ferro constructed in 1936 its first *automotriz*, with a capacity of forty-eight passengers. In the car, all metal, the only unit imported was the motor. Its final cost was 346 contos; an equivalent imported unit would have cost more than 450 contos, since the Brazilian-made car is equipped with a Leylan motor (England) which alone costs 120 contos. The Fábrica de Carroserias Grassi e Companhia of São Paulo, which is one of the best equipped body builders of South America, also constructed, in 1934, an all-metal internal combustion locomotive for the Estrada de Ferro Goiaz, utilizing adapted Ford motors.

4. AUTOMOBILE, BUS, ETC., ASSEMBLY

Throughout the country numerous shops specialize in the construction of vehicle bodies for the imported chassis, among which the most important are those of the Grassi con-

cern and the General Motors Company, in São Paulo. The former is the principal supplier of bus bodies for the lines of the Federal District.

Automobile assembly was formerly undertaken by the General Motors, Ford, and Chrysbraz concerns; but the last has turned over its services to representatives. The General Motors plant in São Paulo is the largest. It was erected in 1929 and is one of the most modern and well equipped of assembly lines outside the United States. From 1929 to 1941, this Paulista factory of General Motors mounted 150,000 cars.

In 1939, 658 trucks were imported, as compared to 9,025 chassis for trucks; in 1940, 186 trucks were imported, as compared to 9,400 chassis for trucks.

5. SHIPBUILDING

There was a time when Brazil constructed all its ships—the period of wooden vessels. With the introduction of iron ships, Brazilian builders had to resort to foreign raw materials and particularly foreign-built units. For a period the only dockyard of importance was that of the Ministry of the Navy. Today, besides this government enterprise which has been enlarged and improved to the point of becoming one of the most modern and best equipped in the world today—there are the yards of the Lloyd Brasiléiro (the largest shipping concern in Brazil), the Navegação Costeira, the Comercio e Navegação, and other small units in scattered sections of the country; the principal yards are in the Guanabara Bay of Rio de Janeiro. In the North, the Belém units are being enlarged and modernized while just recently the Ladário Yards on Brazil's western frontier celebrated the installation of its new units. Facilities are also being installed for large-scale construction of wooden vessels in the states of Pará and Espírito Santo.

6. AIRPLANE CONSTRUCTION

The construction of airplanes, by both Government and private initiative, has progressed rapidly in recent years. Official interest in naval aviation has brought about modern shops with a large capacity of production, where planes for military training are manufactured under license from the Focke-Wulf. The planes are monoplanes with a single lower wing and twin-motor type FW-59 and biplanes with a single motor, open, for primary training, of the type Stieglitz. In the former Navy factory, now owned by the Air Ministry, it is expected that very shortly they will build the Fairchild, primary training, lower-wing monoplane, under license from this American manufacturer. The Army manufactures, under license from Waco, the cabin planes used in the Correio Aereo Militar (Army Air Mail).

Private enterprise is found principally in the efforts of the Fabrica Brasiléira de Anões (Lage interests) which produces the Brazilian-designed Muniz planes series, of which the types M-7 and M-9 are made in great number. Both are biplanes, single straight-line motors of 130 and 200 horsepower respectively, and are used for primary military training. Lage also tried to develop another company to build a smaller type for civilian training which is denominated HL—a monoplane with an upper wing, a cabin with seats in tandem, and a motor of 65 horsepower.

In the state of São Paulo there is also, in regular operation, a plant manufacturing an American type, similar to the HL. The Secção Aeronautica of the Instituto de Pesquisas Tecnológicas, which has made excellent contributions to Brazilian aviation not only in studies but also in testing material and constructing a prototype monoplane with a lower wing, single motor, and all-national construction, is also of importance in this field. The new plane showed excellent characteristics in test flights and is still in use. The Instituto de

Pesquisas Tecnológicas is now planning a cabin plane with four seats and single motor, and of mixed construction—that is, of metal and wood.

Brazil is also organizing a very important aircraft engine factory, and has already purchased the license and rights from the Wright Aeronautical Corporation. This factory, government owned, is now being constructed at "Baixada Fluminense," in Rio de Janeiro, and will very shortly receive the most modern equipment and machine tools from the United States. It is expected that this engine factory will give to the Brazilians an excellent opportunity to start a huge, mechanical industry, and when Brazil has the engines it will have gone far toward solving the problem of planes.

Training planes are of course already being built in São Paulo, in large numbers, by Laminação Nacional de Metais, which also manufactures gliders and motors.

The creation of the Ministry of Aeronautics on January 20, 1941, will no doubt give a great stimulus to the industry not only by coordinating the efforts of the former military and naval forces and the Departamento de Aeronautica Civil but also by building larger civil and commercial air forces.

IX

GLASS, CERAMIC, AND BUILDING MATERIALS

1. GENERAL SURVEY

THE glass, ceramic, and building materials industry is one in which Brazil has progressed far toward self-sufficiency. At the moment two very important plants for the manufacture of plate glass are being installed in Brazil: the Covibra, in Niteroi, and the Vidraria Santa Marina, in São Paulo. Their combined output will meet the total Brazilian requirements leaving a small percentage for export to other South American markets. In the rest of the field covered by this chapter, there is a shortage of higher quality products and fine pieces, due primarily to the scarcity of large deposits of raw materials and the lack of skilled hands.

With the exception of these two disadvantages it may be said that the industry has reached a point where imported products have been almost completely replaced by domestic brands. It has had an exceptional growth in recent years, due in part to the building boom and to increased demands. The construction industry employed in 1938 6 per cent of all the workers in the nation; in 1939, the percentage had risen to 15, and the industry, which had ranked sixth in the nation, had advanced to second place. The earthenware and chinaware manufacturing industries alone increased their number of employees from 39,200 in 1938 to 55,600 in 1939, and their output from 630,000 contos to 790,000 contos. The 1940 output is estimated at 890,000 contos.

2. LOCALIZATION OF INDUSTRY BY STATES

The dominating position of São Paulo is beyond question dominant in industry with 52 per cent of the total in 1938. In the state's total output, 329,000 contos, sanitary equipment and fixtures amounted to 109,000 contos; porcelain, chinaware, and glass together were second—70,900 contos; and cement, third—62,400 contos. Other industries of importance in this state are the manufacture of common tile, mosaic tile, etc., and drains and ducts.

Estado do Rio, ranking second, had 15 per cent of the national output in 1938. The leading industry was cement, which had an output valued at 65,500 contos. Tile and brick manufacture was second with 10,800 contos, and chinaware and glass was third with 9,700 contos.

Third among the states is the Federal District, whose production was valued at approximately 75,000 contos in 1938. Common tile and mosaic tile formed the largest part of the output, and were followed by chinaware and glass. Other products of some significance were tubes, ducts, marble, etc.

Minas Gerais produces 12 per cent of the total, chiefly bricks and tiles; and Rio Grande do Sul produces 2 per cent, principally chinaware and glass products.

The heavy concentration of the industry in the South-eastern section of the country has been traditional in the quality products because of its early attainment of a higher standard of living. Besides the traditional importance is that which arises from a larger consuming market based not only on a higher density of population but also on the higher degree of industrialization. That these factors should weigh heavily on this localization is logical for their bulk raises the transportation problem, especially acute in Brazil, and, in many regions, the raw material is near at hand thus facilitat-

ing the situation of plants in relation to the consuming market.

There is no overly conspicuous branch of this industry, and all share in the total output in fairly appreciable proportions—which again bespeaks the importance of the location of the consuming market in Brazil for this industry.

3. SANITARY EQUIPMENT AND FIXTURES

The manufacture of sanitary equipment and fixtures may be considered as one of the newer branches of the industry. Despite the fact that this began during the World War of 1914–18, the articles manufactured left much to be desired in quality; and with the renewed imports after 1918 the production entered on a period of little progress. In 1926, for example, imports totaled 800 tons; production, 90,000 units. With the increased foreign competition in the domestic market, the production fell to 81,000 units in 1929 while imports increased to 1,000 tons. What might be termed a solid basic development is found only after 1937, the trend being as follows: 1937, 210,000 units; 1938, 2,950,000 units; 1939, 3,740,000 units. In 1938 a group of new and modern establishments began to operate in São Paulo, raising that state to first place in the industry (99.8 per cent of the national output)—a position previously held by the Federal District. The other states which make these products on a fairly important scale are Rio Grande do Sul, Santa Catarina, and Pernambuco.

4. CHINaware ANe PORCELAIN

This industry duplicates the record of that of sanitary equipment. Only in the years following 1937 was there an appreciable rise in production: 1937, 7,800 tons; 1938,

8,900 tons; 1939, 10,700 tons. São Paulo accounted for 82 per cent of the national output for 1939; the Federal District was second with 8 per cent.

Various factors favor the industry as it exists today; one is the protective tariff, and another the discovery of abundant raw material. According to some mining authorities the quality of the raw material is good to excellent, depending upon the location. The greatest defect is on the technical side, principally in the imperfect drying and hardening processes which interfere with the making of fine-quality products. This applies especially to porcelain ware.

5. GLASS

Brazil makes glass of all kinds except—up to the moment—the most important plate glass. This situation has been corrected by the organization of the two companies mentioned above: Covibra, in Niteroi; and Vidraria Santa Marina, in São Paulo. Their two plants are scheduled to start production by June of 1943, and their combined output will meet the total plate-glass requirements of Brazil. The glass imports of 1940 totaling 22,000 contos, included 15,000 contos of window glass alone. As is well known, the industry requires a huge capital outlay which until recent years could not be obtained. Since 1935-37, however, one of the most outstanding trends has been the extension of huge credits to certain prime industries which the country needs for its economic well-being. The loans from the Cartéira (fund) of the Banco do Brasil for the aluminum reduction plant in Minas Gerais, the paper-pulp plant in Paraná, and the Volta Redonda steel plant and the motor factory in Estado do Rio, during the past two years, illustrate this new trend.

The output of plain and cut glass was 2,000 tons in 1925

and 1929, 6,500 tons in 1937, 10,000 tons in 1938, and 7,400 tons in 1939. Approximately 65 per cent of these products are of São Paulo origin, while the second largest supplier is Rio Grande do Sul. The Federal District, Estado do Rio, and Bahia follow in order with 15, 7, and 3 per cent respectively.

Bottles and flasks are manufactured principally in São Paulo, Estado do Rio, and the Federal District. Glass bulbs, glass laboratory equipment, ampoules, table decorations and ornaments, cups, trays, containers, and other table service sets also are made.

The manufacture of colored or stained glass has not developed in spite of a relatively high demand, which must be supplied by imports. This is true also of frosted glass.

Earlier the lack of capital for investment, and now the investment fever in real estate and building, the diversion of capital to certain highly lucrative investments, has hindered the progress of the industry. With the government interest in basic national industries, however, this long-standing obstacle to financial aid will be overcome. There remains, however, another obstacle singularly important from a strictly nationalistic viewpoint: the lack of chemical raw materials—in this case soda ash. This is true despite the fact that the production of salt must be controlled by quotas in order to prevent overproduction.

6. COMMON, MOSAIC, AND GLAZED TILE

The manufacture of common tile is widespread in Brazil and is found in small villages as well as large urban districts. In most cases, the common brick also is produced, principally in the *terra roxa* and red clay parts of the Southeast. It would be difficult to estimate the total production of tile because of this wide distribution; but that which is subject to

the consumption tax shows an output of 3,000,000 square meters annually. On the common brick, the only data available are for São Paulo; the output of that state is more than 10,000,000 units. São Paulo is the dominant producer, with about 65 per cent of the national total. The Federal District produces 15 per cent, and Minas Gerais, Rio Grande do Sul, and Bahia also produce noticeable quantities.

The Paulista State is favored by the large consuming market and by outcrops of clay over vast areas. The principal roofing material in the Southeast is the common red clay tile. It is still common in the South, although the expansion of the lumber industry in that temperate forest region has brought about wooden construction on a larger scale. In the Northeast, variety is the keynote; in addition to roofs of the common tile, there are roofs entirely wooden, and thatched roofs. In parts of the Northeast, the abundant supplies of diatomite have developed a unique, diatomite tile, an ideal heat insulator in semiarid country. This production, which, according to some estimates, amounts to 100,000 tons annually, is not included in the above total, which is based on the consumption tax.

Practically speaking, all the mosaic and glazed tile comes from the Federal District, which in 1939 produced 95 per cent of the domestic output of one and a half million square meters. São Paulo produced but 4 per cent.

7. DRAIN PIPES AND TUBES

The principal states producing drains and tubes are São Paulo with 60 per cent of the total, Minas Gerais with 20 per cent, and Estado do Rio with 11 per cent. Less important are Rio Grande do Sul, Pernambuco, and Espírito Santo. The domestic production of these items is recorded only since 1936, when the total was 4,000,000 units; 1937,

3,800,000 units; 1938, 5,800,000 units; and 1939, 7,900,000 units.

From the beginning the output has been in large part clay drains. Since 1932, the sanitation program in the Baixada Fluminense (Estado do Rio lowlands), which lies on the outskirts of the Federal District, has greatly stimulated the development of another branch of this industry: the manufacture of reinforced concrete drains, principally for surface run-off projects. The sluggish flowoff of the rains of the Baixada Fluminense necessitated the construction of numerous ditches and canals to encourage a more rapid flow. Independent of this large volume of drained water is the small volume that must be drawn off from the isolated regions, which brought a large demand for this type of V-shaped drain tube.

8. CEMENT

The first cement mill in Brazil was erected in Parahiba in 1892—to fail as did another in São Paulo in 1897 which had an annual capacity of 25,000 tons. The basic reasons for the difficulties encountered at that time were the lower price of the imported product, and the insufficient supplies of limestone with less than the critical amount of magnesia. This was also true of another mill which was established in Espírito Santo just prior to the War of 1914–18.

The successful phase of this industry began in 1926 with the erection of the Companhia Brasiléira Cimento Portland of São Paulo. The meager but significant initial output of 13,382 metric tons supplied but 3 per cent of the total domestic demand at the time, the imports having been 396,300 metric tons. In the fifteen years since that time, production has shown, with the exception of one year, an unbroken rise in output to 743,635 metric tons in 1940. Imports in the

same period have shown a general downward trend and in the past year totaled but 22,785 metric tons; exports began in 1938 with 6 metric tons and in 1940 totaled 402 metric tons. Thus, although domestic consumption is not completely satisfied by the national product, there is a clear trend toward that state of affairs. The continuation of imports is based on three factors, the need for special types of cement, the high coastwise freight rates which make the cost of the domestic product prohibitive in some distant nonproducing states, and the large public-works program which creates an unusual demand.

Output has increased steadily, the state of São Paulo producing 49 per cent of the national total in 1940 and Estado do Rio 38 per cent. Production began in Estado do Rio in 1933, and in Minas Gerais in 1939 with an output of 37,944 metric tons. In 1940, this state produced 49,004 metric tons, or 6 per cent of the national total while Parahiba and Espírito Santo had outputs of 36,801 and 11,345 metric tons (5 per cent and 2 per cent of the national total). The total output in 1940 was 84 per cent of the total productive capacity. Small quantities of aluminous cement are also produced in Ouro Preto, state of Minas Gerais.

9. EXPORTATION

As was true of the other manufactures, exports of this classification have shown heartening development, being valued at 147 contos in 1938, over 496 contos in 1939, more than 5,376 contos in 1940, and 10,900 contos in 1941. Similarly, there has been an increase not only in value but also in the number of articles exported—which indicates the diversification of production that has been accomplished in this industry.

One of the newest and most important exports in 1940 was mosaic and common tile while the exports of glass bulbs

for incandescent lamps and glass ampoules were of only slightly lower value than the leader. These two were exported for the first time in 1940.

10. CONCLUSION

This industry, although one of the oldest, is also one of the newest in some aspects and, no doubt, deserves to be placed among the most important industries of the future, so irregular and eccentric has been its growth. In the traditional group one may include the manufacture of tile and brick, while in the newer class are cement, sanitary equipment, drains, ducts, and some makes of chinaware, and those which are left for the future are the high-quality glass and porcelain products and plate glass.

Supplies of raw materials for the traditional group have been and always will be abundant and is one of the reasons for its long establishment. Those for the present-day group are available in varying quantities depending upon the locale while those for the future depend upon certain raw materials which are not yet produced within the country, but which can be manufactured domestically with indirect but substantial benefits for other industries also.

Probably one of the greatest deficiencies is that of craftsmanship and, to a lesser extent, that of technical knowledge in this activity, inasmuch as the lower qualities are produced in sufficient quantities but those demanding manual skill (which is a product of originality and master workmanship) are absent. Brazil has not entered the field of the "unique Brazilian" products as yet.

However, difficult as it may seem to overcome the faults in contemporary industry, it would be sheer lack of foresight to assign a similar fate for its future notwithstanding the magnitude of some of these obstacles, inasmuch as what has been done was accomplished through private initiative

alone while the future has, as an active and extremely energetic element, the support of the Federal Government, which injects not only financial elements into the campaign but also educational and technical.

X

CHEMICALS

1. GENERAL SURVEY

IN THE broad field of "Chemicals" it is difficult to make general remarks which apply to all cases. In Brazil there are further difficulties inasmuch as the manufacture of large amounts of waxes, oils, tanning materials, balsams, herbs and poisons, etc. (by the transformation of vegetable life), overshadows in importance the manufacture of products from a mineral base, with the transformation of one compound to another. The former, which might also be roughly termed "botanicals," or "crude botanicals" when left in the semi-manufactured state, have been important in Brazilian life and exports of the country since early days. Indigo, for example, began to be manufactured in the early eighteenth century; and the first indigo factory established in 1770 in the subtropical zone under the Viceroy, Marquis of Lavradio, was profitable and stimulated the establishment of hundreds of others. In 1796, the exports from Rio de Janeiro alone were 5,000 arrobas (75,000 kilograms). The Marquis of Pombal, the dictator of Portugal during practically the same epoch, prohibited the cutting of the mangrove trees along the seacoasts and swampy shores for use as wood, since the tanning industry was sorely in need of raw material. A native "copal gum" extracted from jatobá and from jutaisica was exported for the first time in 1669. Further export records show that the shipment of such items as indigo, ipecac, cinchona, castor oil, copaiba balsam, medicines, color-

ing materials, acids, and spirits amounted to as much as 161 contos in 1796—of which, a major part was from the port of Rio de Janeiro. The importance of Brazilian redwood exports is a matter of common knowledge and is said to be responsible for the country's name, the Portuguese discoverers having called newly discovered land by the reddish dye-wood which they found, "Brasil."

From the very beginning of this type of chemical industry there has been a constant modification in the importance of the different products, some increasing in value and others losing (like indigo) because of the manufacture of chemical substitutes in other countries, the growing of the same product in other countries on a more rational, and hence a more profitable, basis, and the natural depletion of domestic supplies by the constant exploitation without subsequent replacement. Changes such as the latter two have occurred because the significant factor is that these products are the so-called "extractive" type, that is, they are rarely planted, the process being to extract products of spontaneous growth.

As has been noted, there were some exceptions, and foremost among the nonextractive products were spirits, acids, and gunpowder (while its manufacture was permitted by the mother country, Portugal). The only one of these produced continuously was spirits—which belong among beverages rather than chemicals. Brazil thus for a time had almost no nonextractive products. In the latter part of the nineteenth century match, paint, ink, and perfume industries developed, using imported raw materials. There was thus a long period marked, we might say, by ups and downs of the botanicals and the rise of a chemical industry based on non-vegetable raw materials. This was followed by one in which the botanicals again came into prominence because of increasing demands from other countries for raw materials. Especially prominent were carnauba and other vegetable

waxes and several crude animal-base chemical products such as glue, glycerin, and gelatins.

With the coming of the twentieth century, much seeming progress in manufacture was made as a result of the establishment of branch "factories" in the country by German, English, and American companies. These were not really factories but imported finished products in bulk, which they proceeded to break up and pack for the Brazilian market. The branch factories continue this practice to some extent; but importation in bulk has decreased, and more and more of the manufacture is carried out in the country, so that the products are truly "made in Brazil." The output of botanicals and crude animal base products has continued to rise, and many of these are among the principal exports of Brazil today, such as carnauba wax, the vegetable oils, animal by-products, and fertilizers. The manufacture of the mineral-base chemicals is of relatively recent origin, and its importance is hard to gauge because, while using substantial quantities of domestic raw materials, these require many ingredients that have to be imported.

Salt and pyrites (sulphur), two of the most important bases in this type of industry, are found in quantities in Brazil but never have been used to advantage for heavy chemicals. Here is a field of industry to be developed. There is only one caustic soda plant in the country, and its production is still small, so that a huge annual importation of caustic soda remains necessary. There are recurrent rumors of the establishment of other plants for this highly necessary alkali, but they have never taken concrete form. Despite large deposits of pyrites and sulphurous coal, domestic sources of sulphur have never been much used, and it continues to be imported in large quantities. The sulphuric acid industry, one of the largest users of this mineral, is now supplying sufficient quantities for the domestic consumption. Thus, of both minerals, ample supplies are available; but the by-products of salt pro-

duction are imported in finished state while imported sulphur is used for making sulphuric acid and matches and other products.

Despite some notable development in the domestic chemical industry, the branches of industry which make demands upon it have outstripped it; and the importation of chemicals has increased enormously. In 1874-75, chemical imports ranked fourteenth among the imports, with a value lower than that of silk textiles. In 1910 they had risen to tenth place. At the outbreak of World War I, the annual imports averaged 42,000 tons. In 1925 they had risen to 42,500 tons, and eleven years later the total was 82,500 tons. By 1940 it was 140,500 tons. Before the present war, Germany and England supplied practically 90 per cent of the total imports, but with the extension of the struggle, the United States has become the principal source. Prices have risen, indirectly contributing to the development of several industries in which the manufacturing processes are relatively simple. The total domestic production was valued at approximately 1,500,000 million contos in 1938 and 1,880,000 contos in 1940.

Nearly three-fourths of the Brazilian output is concentrated in two states. The output of São Paulo in 1938 was 611,000 contos, or 41 per cent; that of the Federal District, the latter was 509,000 contos, or 34 per cent. The production of the remaining states is relatively small: Rio Grande do Sul, 103,000 contos, or 7 per cent; Estado do Rio, 83,000 contos, or 5 per cent; and Pernambuco, 41,000 contos, or 3 per cent.

More than one-fifth of the output of the dominant producer, São Paulo, is perfumery, and it includes also fertilizers and glue, calcium carbide and oils, and heavy chemicals. The Federal District's output of pharmaceutical products was 294,000 contos, or practically 60 per cent of its total; perfumery came second, and was followed by paints and

varnishes, heavy chemicals, and the vegetable oils. Rio Grande do Sul produces fertilizers and glue, greases, and pharmaceutical specialties in almost equal quantities. The principal product of Estado do Rio is matches, but paints and varnishes are also of some importance. Pernambuco, a sugar-cane-growing state, naturally produces great quantities of anhydrous alcohol.

Because of the great variety of products included in this classification it is extremely difficult to assign credit to definite factors for the development of the industry in the different states. In general São Paulo's predominance in this industry may be traced to the abundance of labor and especially the all-around conditions favorable to industry. The relatively large pharmaceutical specialties and perfumery industries of the Federal District grew principally because of the many foreign branch factories there. Its facilities for importation and exportation are greater than those of the São Paulo industrial district. Also, the Federal District, as the home of the elite, is one of the largest markets for this type of product in Brazil. The fact that Rio Grande do Sul is the principal livestock state in Brazil explains its greater inclination toward fertilizer, glue, and grease manufacture.

2. ANILINES AND INTERMEDIATES

Brazil is the sole Latin American country which possesses an aniline industry. However, the organic coloring raw material and the intermediates are imported from abroad in order to make the final product. Foreign interests are largely responsible for the introduction of this industry in Brazil. Some growth in the industry is evident in the rising imports of intermediates, from 88 tons in 1937 to 336 in 1939 and 409 in 1940. A countertrend is evident in the decline in imports of organic coloring materials from 775 tons in 1939 to 544 in 1940.

With the rising production of textile materials, it would be safe to say that this industry will always find a suitable market in Brazil. This is particularly true of the silk and rayon products, which have increased considerably since 1937.

3. PLASTIC MATERIALS AND SYNTHETIC FIBER TEXTILES

The plastic materials are discussed in a separate chapter (Plastic Materials and Cafelite) while the synthetic fibers are discussed in the chapter Spinning and Weaving. However, it may be said here that imports of plastic materials and synthetic resins were 450 tons in 1939 and 435 in 1940. The success of cafelite, the new plastic based on coffee, will no doubt determine the future of this industry in Brazil.

4. TANNING MATERIALS

The general trend in leather is for the imports of prepared leather and the tanning materials to decrease. Production figures show an increase in the domestic output of both. Quebracho extract is now manufactured in two plants in Mato Grosso on the Paraguay border. Domestic quebracho is used, but the Paraguayan timber is preferred for its higher tannin content and its abundance. Paraguayan labor, which is highly skilled in extracting this timber from the swamp lands, yields higher net profits and *turmas* (groups) even contract to work the Brazilian forests. The Mato Grosso plants meet half of the domestic demand; the other half is met by imports and by the use of other tannin-containing plants which grow locally, such as mangrove and barbatimao. Of these, the mangrove has been used most; but it has never obtained the favor of the buying public, which finds it inferior and undependable. Some claim that it turns leather

spongy, while others complain of its undesirable color. Others say that these defects are not inherent and can be overcome by careful selection and processing. Attempts of agricultural specialists in São Paulo to grow black wattle have not been too successful.

Despite the modest development realized to date, Brazil exports mangrove and quebracho extract—more than 400 tons of the latter in 1940.

5. ACIDS

Brazil's progress in the manufacture of acids is most clearly expressed in the trends in the import trade for this product. Today, the principal imports are tartaric, citric, tannic, phosphoric, oxalic, formic, and boric acid. There is little or no importation of acetic, hydrochloric, nitric, and sulphuric acids. Soon citric acid is likely to be included in the latter group, with the severe conditions which have struck the citrus industry in general with the war and the blocking of trade with Europe. Great quantities of citrus fruit have been dumped on the local market, resulting in the manufacture of orange oil, lemon oil, and tangerine oil in São Paulo, Estado do Rio, and, it is reported, parts of the Federal District. Some of these have also commenced making citric acid.

Acetic acid, once commonly imported, is now an important local product, with an average annual output of 30,000 tons. Data on the production of nitric acid are unobtainable, but it satisfies the domestic demand; the annual output ranges from 4,800 to 5,000 tons, and the raw material is Chile nitrate. The ideal scheme would be to draw upon the country's hydroelectric resources for power with which to derive nitrogen (and hence nitric acid) from the air. However, these resources have never been developed to the necessary point.

Sulphuric acid production is said to have reached the saturation point in local demand. Practically all the raw material (sulphur) is imported, as we have said. The use of domestic pyrites for making this acid has been seriously considered, particularly by military circles. The national output in 1937 was about 15,000 tons; in 1938, 48,000 tons. São Paulo is now starting to produce sulphur, commercially, as a coal by-product.

6. MINERAL SALTS AND ALKALIS

The increased outputs of soap, textiles, leather, paper, glass, vegetable oils, and beverages (all of which require substantial amounts of salts and alkalis) have created a continually rising need to import such materials. Local industry has never entered into this field in a wholehearted manner. Practically all plans remain plans and are never realized: this refers not only to local Brazilian interests but also to foreign establishments situated in the country. A new possibility of establishing a large plant lies in the apparent desire of the government to encourage vital industries. This is evident in the increasing tendency to grant favors which facilitate their organization and operation.

The present imports of such products clearly indicate the backward situation. The total of the group was more than 56,600 tons in 1940 as compared to 50,000 tons in 1939. Second in importance among the products is soda ash, of which 23,400 tons was imported with a value of 17,736 contos. Sodium nitrate imports were 10,500 tons, valued at 6,785 contos. Others were sulphites, hyposulphites and hydro-sulphites (841 tons, 5,761 contos), lead arsenate (1,300 tons, 5,298 contos), potassium chlorate (2,957 contos), bicarbonate of soda (2,602 contos), copper sulphate (3,778 contos), aluminum sulphate (2,820 contos), Glauber's salts (2,113 contos), sodium chromate (2,506 contos), and potassium

chromate (1,399 contos). In this list are many products which may be obtained from the same process or raw material and in that sense suggest the possibility of establishing an integrated system of industries which would solve this problem with the least expenditure. The annual importation of caustic soda in recent years has averaged 30,000 tons and is the most important of the group. The establishment of a large plant for the manufacture of this chemical would no doubt also do much to solve the problem of supplies of other dependent salts and chlorine products. A small plant is established in Estado do Rio and has annual production of 2,000 tons, or about 6 per cent of the present imports. Although small, it also produces quantities of hydrochloric acid (600,000 kilograms), liquid chlorine (100,000 kilograms), and calcium chloride (750,000 kilograms). Definite plans for the production of caustic soda by one of the chemical plants already established in São Paulo are being made, the initial annual output being estimated to reach 12,000 tons. Besides caustic soda, the same concern is projecting the manufacture of soda ash, another heavy import of Brazil.

Soda-ash production and exports have been recorded from time to time, but this product is derived from the process of burning wood and does not strictly enter into the customary classification given to the product.

Brazil has not yet discovered potassium deposits of any commercial value, and manufactures few chemicals with this base. This is in strict contrast to the raw-material supplies of the other chemicals mentioned above, which depend upon salt, aluminum, chrome, etc., all of which are obtained in sufficient quantities and are exported. It is interesting to note, however, that the interest in this industry is not new: the coffee-bean shell was used for the manufacture of this product over thirty years ago in the state of São Paulo. Results of this venture are unknown, but no known continuation of this industry exists today.

7. MATCHES

The match industry was of early origin, and even before the war of 1914-18 there were numerous factories devoted to the exportation of this product. Shipments were much larger in the earlier years than today—24 tons in 1911 as compared with 2 tons in 1940. In 1907 there were eighteen plants, and nearly 4,000 workers were employed. The largest of the plants were in São Paulo and Estado do Rio, but Paraná and the Federal District also were producers. São Paulo in 1939 produced 304,600,000 boxes, or 46 per cent of the national total, while Estado do Rio had an output of 186,900,000 boxes, or 28 per cent. Paraná was third in output with 13 per cent, and was followed by Rio Grande do Sul with 8 per cent and Santa Catarina with 4 per cent. Brazil's annual output declined from more than 800,000,000 boxes in the 1920's to 602,300,000 boxes in 1937, from which it rose to 627,700,000 boxes in 1938 and 659,400,000 boxes in 1939. The general reduction is said to result from the international agreement in force among the producers.

The concentration of the industry in the South and the Southeast will be noted. This may be explained by the fact that nearly all of the wood utilized is from the states of Paraná and Santa Catarina. Material for the match heads is largely imported. Wood supplies profoundly affected the location of the early factories, which were all concentrated in this region. Today there is a noticeable spreading of the industry.

8. GUNPOWDER AND EXPLOSIVES

The history of the gunpowder and explosives industry is intimately linked to the Fabrica de Pólvoras e Explosivos de Piquete in São Paulo, a unit of the Army. For a time this specialized in products for military use, but later it de-

veloped along lines which may be termed commercial, as is shown by a partial list of its products: sulphuric acid (arsenic-free) for laboratory work, commercial sulphuric acid, nitric acid, hydrochloric acid, ether, acetone, colloidal cotton, colloids in general, gunpowders, ammunition, nitro-glycerin and other explosives including dynamite. During more than thirty-two years of existence (this plant was founded in 1909), it has contributed greatly to the development of the national chemical industry, paving the way and helping its component parts to function with profit by offering a market for their goods. Today, it is the only factory in Latin America which manufactures powders with a single and double base. Not a single accident has been registered as yet—a striking proof of the effective safety measures taken and a credit to the technicians. Two other important units of the Army total of five are the powder factory at Estrela and the ammunition unit at Realengo.

Civilian production is located principally in the state of São Paulo where there is an annual output of approximately 200 tons of dynamite, 4,000 tons of carbon sulphide, and 20,000,000 rounds of ammunition. Lead-shot manufacture is also an industry of some importance. The total output of the country amounted to approximately 25,000 contos in this branch of industry.

A related industry, fireworks, has an annual production of about 3,200 tons valued at 11,200 contos. Estado do Rio leads with an output valued at 6,700 contos while Paraná is second with 1,500 contos. Bahia and Paraná also are producers.

9. FERTILIZERS

Brazil has produced some animal and vegetable fertilizers of a chemical nature—bone meal, fish meal, blood meal, guano, oilseed cake, etc.—but it is only recently that there

has been a purely chemical development based on its mineral wealth. A plant for the manufacture of nitrogen fertilizers and ammonia using nitrogen fixation of air is under study while definite progress has been made in the industrialization of the phosphate deposits at Ipanema in São Paulo. In Maranhão is a variation of bauxite which is rich in phosphorus. Some nitrates are found in the section of the *grutas*, in the northeastern mountains of Brazil; but the possibility of exploiting them is doubtful.

With the extraordinary fertility of the soil, especially in the rich agricultural sections of São Paulo and Minas Gerais, the use of fertilizers has not been necessary. Continuous cultivation apparently has not exhausted the *terra roxa* and *massapé*. In addition, the general economic movement found in all countries in which a livestock industry advances into virgin land in the vanguard of agriculture brings to mind another factor which contributes to a relatively small fertilizer consumption. In São Paulo livestock is at the extreme west, agriculture having gradually forced it to its last foothold in that state. In Minas Gerais it has not been pushed back so far, and cattle are still to be found close to many populous sections. Thus men who have exhausted the first richness of the soil where they are, still have considerable areas to which they may migrate without resorting to fertilizer. It is only close to the coast and in a section reaching back into the state of São Paulo that intensive farming has come in which requires fertilizers; and these have always been the green, animal, or transformed vegetable fertilizers.

Chile nitrate is the principal fertilizer imported because of its cheapness and its ready solubility, which makes it ideal for the seasonal crops that are grown in these intensive farming sections. The imports in 1940 were 18,500 tons; in 1939, 22,000 tons. Other chemical fertilizers imported were sodium nitrate (18,600 tons), superphosphates (15,800 tons), potassium chlorate (2,500 tons), ammonium sulphate (1,400 tons),

natural phosphates (900 tons), potassium sulphate (120 tons), calcium cyanamide (260 tons), crude potassium nitrate (120 tons), nitrofocal (5 tons), and others for a grand total of 41,600 tons valued at 27,700 contos. In running the array of fertilizers according to unit price, the greater amounts are usually those which have the lowest unit price. This tendency, which was more pronounced in earlier years because of the lack of orientation, was modified by the dissemination of agricultural education through the government experiment stations, the cooperative agricultural fields, seed stations, and the buying and selling cooperatives. So pronounced has become the trend toward the rational utilization of fertilizers that some of the cooperatives and the larger agricultural units, which might be properly termed "fazendas," manufacture their own type of fertilizer from bones or blood to suit the crop and the land they are to cultivate. Another factor in this general fertilization program is the prohibition of exportation of some Brazilian fertilizers in spite of higher prices in the export market, in order that Brazilians may enjoy the benefit of relatively cheaper fertilizers.

Although imports tend to remain at 40,000 to 45,000 tons annually, domestic consumption is on the increase, and all differences are usually filled by domestic production. National data on production are unobtainable because of the wide variety of types. Data on the production of São Paulo show that the state total in 1938-39 was 57,000 to 60,000 tons. Of this total, 23,000 tons, or approximately 40 per cent, was bone meal, and there was 8,000 tons of other industrialized animal residues. Vegetable base fertilizer production amounted to about 15,000 tons, while the chemical varieties totaled 11,000 tons. In 1940, the Ipanema plant was completed and production was under way. Phosphates of various degrees of purity were distributed among agriculturists to observe results; but, in general, the opinion is that the

mineral in the crude and crushed state does not give the best results, so that further preparation is necessary. For the *terra roxa* of São Paulo, which contains quantities of iron, it was determined that *rophosphates* would be preferable to superphosphates. This in turn favors the establishment of a processing plant at Ipanema instead of in the industrial section near the city of São Paulo, which would avoid transporting the ore from the mine and take advantage of the feasibility of bringing the sulphuric acid to the mine.

The bauxite of Maranhão could be used for fertilizer, as we have said; but high transportation costs and the fact that in the North there is little intensive farming stand in the way.

10. INSECTICIDES, FORMICIDES, AND FUNGICIDES

The relatively low consumption of insecticides, formicides, and fungicides is due to the fact that the agricultural production long was predominantly of coffee and practically all federal agricultural assistance went to the one crop. Naturally this caused those crops which demand greater care against insect and botanical damage to be abandoned. A complete revaluation of crops has taken place under the Vargas Administration, and great transformations have come about with the federal assistance to agriculture and the livestock industry. The aid has taken the form of experiment stations, seed stations, direct agricultural education, sanitation of fertile zones, foundation of schools of practical agronomy, etc. Part of this program has been instruction in the use of insecticides, formicides, and fungicides. However, it is to be remembered that it began only in 1935-40 and therefore has not yet won complete acceptance in agricultural activity, which explains the relatively low consumption in proportion to the huge output.

Copper sulphate is the principal chemical of this type imported; others, including arsenic, are imported crude and manufactured in the country. Prepared insecticide and formicide imports amount to 400 tons annually while lead arsenate purchases average 1,200 to 1,300 tons.

The compounds manufactured in Brazil may be divided into two different groups—those of vegetable origin and those of purely mineral or chemical origin. In the former one notes, first, timbo powder, made principally in the North. Industrialization of this product is difficult because large quantities of imported solvents are needed for the finished product; therefore most of the pulverized root of timbo leaves the country in that state. Nevertheless, small quantities are made into timbo powder, which may be applied directly in agriculture. The vegetable insecticide second in importance is pyrethrum flower, which is grown in the South. The production of Rio Grande do Sul, still in the initial stages, has been increasing by leaps and bounds. In 1938 and 1939 the output was estimated at 300 tons each year; in 1940 this practically doubled; and the 1941 output is estimated at more than 800 tons. The industrialization of this flower, though on a small scale, is important, and at Pelotas five plants are engaged in the production. The state, being an agricultural and livestock center, uses much of the product and exports only one-fourth to one-third of the output.

On chemical insecticides, data as to total outputs are not obtainable. That the manufacture of the arsenic compounds is relatively important is indicated by the volume of imports and the utilization of the domestic mineral—the 1940 output of white arsenic having totaled 1,088 tons. Another development is based on the utilization of the copper of the South. This, however, is decidedly small. More important from the standpoint of output is the manufacture of aluminum sulphate in Minas Gerais and São Paulo; how much of it is

turned over to these ends is questionable because of the lack of consumption figures.

The recurring tobacco crises suggest the manufacture of nicotine; but as yet there is no large-scale production of this liquid.

11. PAINTS, INKS, VARNISHES, AND ENAMELS

Although this industry is among one of the oldest in the country, its early history is clouded in obscurity. Until 1930 the annual output had hardly exceeded 2,500 tons valued at 10,000 contos. The slight impulse imparted by the war of 1914-18 rapidly lost effect in the postwar period, with foreign competition and the poor equipment of domestic factories. Today the annual output is slightly more than 22,000 tons with a value of about 115,000 contos.

In this progress, a fundamental transition must be pointed out. The manufacture of inks, paints, etc., has tended to rise, as was shown; but, in general, the increase has been accomplished by the use of imported raw materials. The imports of the basic coloring materials and pigments are considerable despite the manufacture in Brazil of graphite, colored earths, kaolin, titanium base colors, and some powdered metallic colors in some quantities. The change in classification of imports does not permit strict comparisons; but, turning to a highly limited two-year war period, one finds that the imports in 1939 and 1940 averaged 6,900 tons annually, of which unprepared litharge and zinc white amounted to 3,400 tons. Another vulnerable point which must be strengthened is the manufacture of the accessory product, turpentine, the imports of which increased from 2,000 tons in 1933-34 to 4,000 tons in 1939. There was a decrease in 1940 to 2,100 tons. This apparently favorable change, however, is conjectural inasmuch as domestic production is exceedingly limited and the plant capacities are

low. One brilliant point in a program to reach self-sufficiency was attained in the phenomenal increase in output of linseed oil made from home-grown linseed.

Some progress has been made in the manufacture of writing and printing inks. Imports of writing ink were slightly more than 100 tons in 1913—a period in which the consumption was decidedly lower than it is today. In 1930 they had fallen to 60 tons, and in 1940 to 27 tons. Although the data are not strictly comparable, it should be noted that the domestic production of writing inks amounted to 1,500 tons in 1929, rose to 4,300 tons in 1938, and fell to 1,100 tons in 1939. Today, a fairly large part of the domestic consumption is filled by national inks; the imports are principally those of the fountain-pen manufacturers of the United States, whose advertising has established a certain stable market for their product. In this connection it may be noted that there is no advertising by Brazilian manufacturers.

The principal manufacture of writing inks is in the Federal District—725 tons as compared to the 342 tons of São Paulo. The output of São Paulo has had wide fluctuations, from 831 tons in 1937 to 3,216 tons in 1938 and the 342 tons of 1939. Rio Grande do Sul and Minas Gerais produced 19 tons each in 1939. This industry developed in São Paulo and the Federal District largely because it was necessary to import the principal coloring materials, and the largest producers have been in these states from early days.

The record of printing inks closely parallels that of writing inks, inasmuch as the development was sharply modified with the sudden spread of education in the period following 1932. The imports were 320 tons in 1913 and 500 tons in 1928. Since then the imports have dropped to 250 tons, and the national output amounts to 3,400 tons annually. In 1940 Brazilian printing inks began to be exported. Prior to the present war, the principal imported inks were German and

Japanese; those from the United States found little demand because the presses and machinery were not adapted to them. When the war cut off the former sources the printing industry perforce turned to Brazilian sources, which fortunately have developed sufficiently to fill the needs although there is some doubt as to raw-material supplies.

The combination of production statistics for water colors and paint interferes with an accurate appraisal of the conditions in these two industries. The import trends, however, indicate self-sufficiency in water colors. In paint substantial progress has been made; but production is not yet on a level which insures independence from foreign sources. As was pointed out above, much of the raw material for paint is imported. Importation of water colors amounted to 20 tons in 1940 while that of prepared paints was slightly less than 300 tons.

The national production of water colors and paints shows an irregular upward trend: 1,200 tons in 1929; 7,400 in 1937; 5,600 in 1938; 10,000 in 1939. Contributing heavily to this rise is the development in the state of São Paulo whose 1939 output was 7,300 tons, or 73 per cent of the national total. The Federal District was second with 1,800 tons, and was followed by Estado do Rio with 600 tons and Rio Grande do Sul with 160 tons.

Pyroxylin base paint imports amounted to 230 tons, while those with a varnish base totaled 196 tons.

In general, the reasons which explain the localization of the paint industry principally in São Paulo apply also to the enamels and varnishes, of which the Paulista state produced 1,170 tons in the national total of 1,520 tons in 1939. In these, too, the Federal District ranked second, producing 165 tons. Rio Grande do Sul, Pernambuco, and Estado do Rio had a smaller output. National output of these two products rose from 170 tons in 1929 to 422 tons in 1937, 1,423 tons in 1938, and 1,520 tons in 1939. Accompanying this

increased production is a general decrease in the imports, the 1940 total being 350 tons.

The location of the greater part of the production of varnishes, enamels, and paints in São Paulo has little traditional importance inasmuch as the leadership of this state is only apparent since 1935, when it took a sudden spurt upward. The Federal District's supremacy was, until then, based on its satisfactory location for importing the pigments and other basic raw materials including oil.

12. VEGETABLE OILS, WAXES, AND CANDLES

The botanical richness of Brazil contributes heavily to the production of large quantities of vegetable oils. Practically the only oleaginous seed imported is linseed, and even this has been reduced with the spread of its cultivation in Rio Grande do Sul. The great differences in climatic and geological conditions throughout the country also insure a wide variety in types of seed through which there is possible a constant interchange of one product for another that has proven of invaluable assistance in filling deficiencies in the domestic market. A lack of tung oil brings forth oiticica; a deficiency in peanut oil suggests a number of substitutes of which the principal are sesame, murumurú, and cottonseed oil; the lack of olive oil forces the perfection of cottonseed oil extraction and suggests the use of tropical oleaginous seeds; and so on. The extent of this variety can be realized sharply from the following partial list of materials from which the oil was actually expressed in 1939, with the amount obtained: cottonseed (75,700 tons), oiticica (3,160 tons), linseed (8,060 tons), babassu (5,340 tons), ricin (2,320 tons), castor (1,470 tons), peanut (105 tons), coconut (640 tons), murumurú (140 tons), urucurí (70 tons), coffee (1,040 tons), andiroba (400 tons), sesame (one ton), Brazil nut (115 tons), pracaxí (35 tons), macauba (25 tons), tonka

bean (10 tons), tacum (10 tons), mustard (insignificant), curauá (20 tons), palm (10 tons), ucuúba (1,085 tons), sunflower (70 tons), corn (60 tons) and a type which is denominated "kernels" (35 tons).

This industry may be said to have commenced in the North, with the tropical oilseeds. Some were sought for their medicinal qualities, others for their pleasant odor, still others for their taste, and some for the limited industrial uses to which they were applied at the time. Later, the increased cultivation of cotton and the heavy demand for castorseed gave the industry an entirely new aspect, that is, the predominance of the cultivated seed over the so-called "extractive" product, the latter being characteristic of the tropical seeds. The expression of cultivated seeds now leads in this industry, with the overwhelmingly large output of cottonseed oil. There has been a revival in importance of the "extracted" product in the rise of oiticica; but even this is now cultivated for the sake of a greater control over the characteristics of the oil, which takes the place of tung oil. The importance of the exports in this development can hardly be overlooked, and played a large part in the rise of cottonseed oil, of which Brazil is one of the world's leading exporters.

Pará in the extreme North is the sole state producing the tropical oils of murumurú, pracaxí, ucuúba, Brazil nut, and curauá, while São Paulo is the leader in cottonseed, coffee, sesame, sunflower, and corn oil production. Bahia is the sole producer of palm oil, and Paraná the only state manufacturing mustard-seed oil. Piauhy monopolizes tucum oil production, and Ceará the output of oiticica. Minas Gerais produces the oil known commercially as macauba. All told, however, São Paulo has the largest output and accounted for 82,980 tons in a total of 124,500. Far behind are all the competing states—Parahiba, the Federal District, Rio Grande do Sul, Ceará, and Pernambuco—which produce from 4,000 to 9,000 tons annually. Bahia, Maranhão,

Rio Grande do Norte, and Pará produce between 1,600 and 3,200 tons.

Cashew-nut oil is a new product developed in the North-eastern states during the present war, India, the world's largest producer, having become an uncertain source for the Americas.

In this list of oils are some which are to be classified as foodstuffs inasmuch as they are edible. Because of the innumerable uses to which some of the oils may be applied, however, it is difficult to give separate production figures for industrial oils and edible oils. However, an appreciation of the general rise in production would, roughly speaking, be applicable to the trend in each of these types. In 1932 the production was estimated at 19,000 tons; in 1934 it was 27,700 tons; in 1936, 74,300 tons. The output passed the 100,000 mark in 1938 and remained close to this level in 1939. In 1940, as was mentioned, the total was 124,500 tons. Subsequently it has doubtless increased greatly, with the shipment of seeds in the export trade discontinued in favor of oil, to save space.

There are also produced several essential oils, including that of *páu-rosa*, or rosewood. Most of this is from the Amazon basin, particularly in the Oyapock section, and practically all of it is exported, so that export figures give a fairly accurate picture of its output. In 1929, 4,500 kilograms were exported; in 1941, 275,128 kilograms. Many other essential oils are produced from the riches of the tropical forests. One of importance in the subtropical zone is that of citrus, which has had a much larger output in recent years with the crisis in the exporting of citrus fruit.

The Brazilian production of crude waxes, such as carnauba, uricurí, and some of the tropical vegetable waxes, amounts to approximately 14,000 tons annually. Contrasted to this is the 2,500 tons of "finished" waxes—shoe polish, floor wax, etc. In addition to the vegetable waxes, beeswax

totals about 1,000 tons annually and is concentrated in the Southern states.

Carnauba wax is found principally in Ceará, Piauhy, and Rio Grande do Norte, where the occasional droughts force the palms to bring to the surface of their leaves a waxy substance which prevents the evaporation of the water of the plant into the air. When the leaves are harvested, the waxy substance turns to powder and is gathered and purified to make the carnauba wax of commerce. Further refining and addition of foreign substances produce floor polish, shoe polish, phonograph records, etc. Although carnauba wax is produced in the semiarid Northeast of Brazil, the polish is made in São Paulo and the Federal District, where several Brazilian firms and one with American capital are operating. The production in São Paulo amounts to about 1,200 tons annually while that in the Federal District is 810 to 820 tons.

Uricurí wax is in reality a carnauba wax substitute and is produced principally in the western to southwestern part of Bahia, although it is not uncommon to find uricurí palms thriving on the borders of the neighboring states. Some *sertanejos* (people of the hinterland) used to mix impurities in the wax and thus obtain greater weights. This practice has been ended recently with the establishment of a "purification" factory in Jequié, Bahia, in the heart of the uricurí zone. By a special patented process, the wax is mixed, purified, and filtered to remove foreign particles and eliminate variations in quality. Brazilian exports indicate an annual production of about 2,000 tons.

The prevalence of the Catholic religion throughout Brazil partly accounts for the large consumption of candles in the country. In some remote parts of the interior candles and calcium carbide provide the only means of illumination. However, the consumption of candles has been diminishing, and, with the difficulties in creating an export market,

production also has declined. In 1939, the state of São Paulo produced 2,700 tons of candles; the Federal District, 1,400 tons; Rio Grande do Sul, 770; Paraná, 630; and Bahia, 440 tons. Not only is beeswax used, but also large quantities of animal fats.

13. ALCOHOL

Alcohol manufacture in Brazil dates from the time of the Sugar Cycle. Prior to this period, "spirits" appeared among the exports, suggesting that the production of alcohol was one of the earliest industries to be established in Brazil. Though it is historically important, it did not show any appreciable increase in production until 1931. Then a severe sugar crisis demanded immediate solution, and one of the suggested remedies was the production of alcohol. One objective of this was to reduce the importation of motor fuels—another serious problem which faced the government at the time. The mixture of alcohol with gasoline is now required by law, and in recent years has averaged 45,000,000–50,000,000 liters of alcohol to 250,000,000–260,000,000 liters of gasoline, a 19 to 20 per cent mixture in all nonaviation gasoline sold.

Today, Pernambuco is the principal state producing alcohol, with 43,500 tons in the 1940 national output of 110,000 tons. Estado do Rio, another important sugar producing state, had an output of 24,500 tons; São Paulo produced 28,000 tons. Smaller quantities were produced by Alagoas, Minas Gerais, Santa Catarina, Sergipe, Parahiba, Mato Grosso, and Espírito Santo.

There are approximately 175 distilleries in Brazil, of which 30 produce anhydrous alcohol and the remaining 145 make potable alcohol. The daily capacity of the former is 427,000 liters, and that of the latter 513,600 liters. Pernambuco has 58 distilleries with a daily capacity of 343,400 liters;

Estado do Rio, 26 distilleries with a daily capacity of 231,400 liters; São Paulo, 31 distilleries with a daily capacity of 221,300 liters.

To date the principal raw material used for alcohol manufacture has been sugar—which explains the leadership of the sugar-producing states in its output. Tests with manioc root (two-year-old plants) show a relatively high yield of alcohol and will, no doubt, provide a new source in the future. This will probably shift the centers of production, although it must be noted that manioc root is produced in all states of the Union. The fact that much of Brazil is tropical or subtropical eliminates the potato as a source of alcohol.

During 1942 the alcohol production reached 90,000,000 liters. For 1943 it is estimated at 150,000,000. Brazil owns one of the most complete alcohol-producing installations in the whole world, much of the machinery for which is manufactured within the country.

14. PERFUMERY AND TOILET ARTICLES

The perfumery and toilet articles industry has today acquired a rhythm of production which is decidedly animating. Its origin is found in the period of the First World War, when the country first succeeded in liberating itself from the idea that manufactures had to come from the northern industrial countries, and that for Brazil the best policy was the exportation of coffee and some minor agricultural and animal products. The import trade of those days may be summarized as follows: England supplied articles for men, and France articles for women. England still has some influence on articles for men, but the influence of France has diminished and at present is concentrated in perfumery and face powder. In the last decade, however, the United States has entered the market strongly and the present war has become outstanding among the foreign sup-

pliers of perfumery and face powder. This has been accomplished partly through direct importation of the finished articles, and partly through the opening of branch factories and agencies in the country which avoid the tariff barrier. France and England also have adopted this method in part while Spain also appears with representation but not to the same extent as in Argentina. It is to be noted, however, that nearly all the products except tooth pastes, shaving soaps, face powders, and perfumes are manufactured in factories legitimately Brazilian.

The leadership in the production of perfumery and toilet articles passes to and fro between the Federal District and São Paulo. In 1938, when the national production exceeded 224,554,000 units, the Paulista state led with an output of 115,293,000 units, and the Federal District was second with 79,472,000 units. In 1939, however, the Federal District led with an output of 69,396,000 units, or 51 per cent of the total, while São Paulo was second with 59,922,000 units, or 35 per cent (the contrast between these years is due to the decreased output of soap, of which São Paulo is an important producer). Rio Grande do Sul was third with 4 per cent of the total, while Minas Gerais contributed only 3 per cent of the total. Pará was fifth with 1 per cent.

The distribution of production of the principal items of perfumery and toilet articles in 1939 is shown in the table on page 250.

In general, all items tend to increase in output. However, one striking exception is the production of "lança perfume," used during the Carnival holidays for spraying onlookers or passers-by. São Paulo, formerly the leading producer, has had a severe decline in output so that today Pernambuco leads in production. The Companhia Rhodia of Santo André, near the city of São Paulo, formerly an important producer, has turned to the manufacture of industrial chemicals. Another reason for the rise of the North and Northeast is that the

PRODUCTION OF PERFUMERY AND TOILET ARTICLES, 1939

	Total Units	Leading State and Units	Second State and Units
Extracts	6,000,000	Federal District 3,000,000	São Paulo 1,000,000
Lotions	5,000,000	Federal District 1,500,000	São Paulo 1,500,000
Make-up	3,000,000	Federal District 1,800,000	São Paulo 370,000
Toilet water	63,900	Amazonas 63,900	
Hair tonics and dyes	2,000,000	São Paulo 380,000	
Talcum powder	25,000,000	Federal District 13,000,000	São Paulo 2,500,000
Rouge	9,500,000	São Paulo 5,000,000	Federal District 4,500,000
Brillantine	8,000,000	Federal District 5,000,000	São Paulo 1,500,000
Perfumed oils	10,000,000	Federal District 5,000,000	São Paulo 2,000,000
Toilet soap	45,000,000	São Paulo 45,000,000	Federal District 22,000,000
Tooth paste	12,000,000	Federal District 9,500,000	São Paulo 500,000

celebration of the Carnival in Rio de Janeiro and São Paulo has been shifting from the street to the ballrooms, while in the North and Northeast the open-air celebration continues to be popular.

As was noted above, the Federal District and São Paulo continue dominant in the perfumery and toilet articles industry, the larger foreign and Brazilian firms being in this section. There is also the attraction of the large local body of consumers.

15. PHARMACEUTICAL PREPARATIONS

Because of the development of the local chemical industry and the abundant resources in flora and fauna, the pharmaceutical industry has made notable progress in recent years. Except certain chemical medicines, practically all of the more common medicines are produced in Brazil. The war has brought about the local production of some medicines hitherto imported, adding many new lines to the industry as a whole. There are nearly five hundred laboratories, which supply about 90 per cent of the necessary products, including the biologicals. About fifty of these are operated by foreign firms. An interesting development is the participation of the Federal Government in this work, principally in the manufacture of human and animal biologicals for governmental consumption. A limited quantity of these products also reach the civilian market.

It is estimated that the retail sales of medicines in Brazil are 700,000 contos—tonics being about 35 per cent of the total, laxatives about 30 per cent, blood purifiers 15 per cent, and sedatives 10 per cent. Twelve laboratories, including those of the government, supply approximately 90 per cent of the human biologicals and 95 per cent of the veterinary biologicals.

Today, practically all the foreign medicines sold in the

local market in appreciable quantities are made in Brazil, in either foreign or national (agencies) laboratories. Formerly the finished product was imported in bulk form and packed in Brazil; but the tendency now is to import the compounds and make the medicine in the country.

France and England were long the leading suppliers of the Brazilian market. After the war of 1914-18 Germany gradually became the leading source of supplies. Numerous branches of German factories were opened in Brazil. The Swiss manufacturers have earned an enviable reputation with their products. In the last decade there has been a noticeable penetration by American manufacturers with branch laboratories; but although their products enjoy a fairly high reputation, these have always been considered high-priced. The difficulty or impossibility of obtaining European, particularly German, preparations is the sole explanation of the present North American control of the trade.

There are about seven thousand pharmacies in Brazil, of which two are chain organizations with outlets throughout the country. There are two hundred other pharmacies in hospitals, clinics, and similar institutions. Approximately five hundred pharmacies engage in both wholesale and retail trade, while one hundred are exclusively wholesale. About three-fourths of the latter are in the Federal District and São Paulo.

Among the drugs, medicines, and pharmaceutical preparations imported in 1940, injections stood high (as was true in 1939). The imports, in order of importance, were: injections (12,070 contos), quinine (3,790 contos), medicinal drops (1,970 contos), medicinal pills and powders (1,370 contos), pastes (1,295 contos), and balsams and medicinal pomades (1,090 contos). Imports of codeine, morphine, serums, vaccines, and purgatives have fallen off greatly.

Production in Brazil is scattered, and exact figures on output are not to be had. Besides the crude medicines which

may be classed as herbs and medicinal plants, there are scientifically prepared products. In the former group, some of the more important are: copaiba oil, andiroba oil, jutaisica, jatobá, ipecac leaves, tonka beans, jalapa, sarsaparilla, araroba, anibá, and joazéiro.

The list of scientifically prepared products is too long to include here, but special mention may be made of insulin (produced in Rio Grande do Sul) and vaccines against snake poisons.

16. EXPORTATION

The progress made in the production of chemical products and pharmaceutical and toilet articles has been quadrupled in the exports of such products. From 67,410 contos in 1938, they rose to 80,650 contos in 1939, to 125,850 contos in 1940 and 272,400 contos in 1941. The increases were not due to a higher unit price but resulted from a rise in volume. This bespeaks not only the progress of the industry itself which has permitted a surplus in some products, but also the quality of these products which are now accepted in foreign markets in greater quantities.

Leading the exports are the vegetable oils, which totaled 97,000 contos in 1940 and 194,600 contos in 1941; rosewood essence is second, and drugs and medicines third, followed by citrus oils, marine blue, absorbent cotton, quebracho extract, gauze, perfumes, calcium carbide, and soap.

17. CONCLUSION

One is struck, in the chemical and pharmaceutical industry, by the great influence which the foreign branch factory has exerted in the development of national production. The English have entered strongly in the pharmaceutical and toilet articles industries, as have the French and Americans.

The Germans have centered their attention upon the medicines and some chemicals. How have the Brazilians fared under this competition? In general, the foreign branches are limited in number and do not enter into all lines, while Brazilian capital is spread over a large number of activities and thus accounts for a major portion of the total output. However, in the lines of goods which compete directly with the foreign Brazilian-made article, the latter is decidedly superior, principally because of the aggressive advertising campaign usually undertaken by the maker, which the Brazilian producer tends to shirk or conducts in a less appealing and effective way. Differences in quality and price are dismissible in a majority of cases and in other cases are more a matter of personal opinion than a general current feeling. Brazilian buyers often demand the product by the brand name alone without naming the product, so great has been the influence of this advertising program.

Great as has been this foreign influence to date, there has been noticeable, in recent years, another distinct trend which will no doubt greatly affect the future course of the industry. The continual importation of certain products (principally chemicals and some highly indispensable medicines) which must be produced at home has caused the government to give more than usual assistance to enterprises undertaking to make these, through import duty exemptions on the equipment purchased abroad, tax exemptions or reductions, long-term loans, etc., until they have passed the infant stage and play an important role in the production of "new" products in Brazil. This governmental assistance is constantly entering into new fields, and has been extended to older industries that have run into special difficulties because of the war.

It is plain that the government interest is in encouraging the development of new industries and strengthening the old, while leaving the business policy and procedure to pri-

vate initiative. Some of the newest developments in the latter field, virtually resulting from the present situation, will no doubt bring revolutionary changes in the chemical industry of the country. With regard to cafelite, the production of the plastic requires few raw materials and will reach a total three times the present output of the United States; in addition, there will be available such products as coffee oil, caffeine, and furfural (mentioned in the special chapter on this subject). Expectations for the babassu kernel are based on the supplies of acetic acid (now in great demand in the United States), methyl alcohol, glycerin, and charcoal that a new factory in Maranhão will furnish—all of prime importance, and charcoal particularly in the light of the fuel problem in Brazil.

A situation entirely new in this field will certainly result from the operation of the Volta Redonda Steel Mills, which are going to produce from the outset:

Ammonium sulphate	4,000 tons
Light oils	3,600 tons
Toluol	200 tons
Coal tar	9,000 tons

XI

PLASTIC MATERIALS AND CAFELITE

1. GENERAL SURVEY

THE overproduction of commodities brings to each producing country a problem of attaining a practical solution which tests its technical as well as economical ingenuity. At times, the two work well, hand in hand, to attain the desired goal. In the case of potatoes there is, on the technical side, the production of alcohol, of synthetic rubber, of starch, and of by-products based on these; and on the economic side the effort is toward better distribution. In the case of sugar, the production of alcohol, of special paper, and of numerous products with a molasses base have helped on the technical side; and crop area reduction, planting of specific varieties, and international marketing arrangements have helped on the economic side toward decreased output or increased absorption of surpluses. Other products which have been helped out of difficulties by such measures are soya beans, coconuts, and cotton.

For Brazil, the chronic problem was coffee, solved by the apparently cheap, but actually costly, method of burning, which requires quantities of fuel oil inasmuch as the bean does not ignite readily. Year after year, an average of 4,000,-000 bags had been unmarketable and had given rise to much discussion, and elaborate plans such as price fixing, taxation of exports, reduction of the planted area, uprooting of old trees, and prohibition of planting new trees. Plans also were proposed for the utilization of coffee as a raw material, but

the cost of processing, shipping, and distribution interfered.

In 1939, the Polin Laboratories of New York announced a process by which coffee was converted into a plastic molding material, and its discoverer, H. S. Polin, was invited to come to Brazil and demonstrate and discuss the process with the Departamento Nacional do Café. After a study of the technical aspects of the process, the D.N.C. purchased a pilot plant in the United States capable of converting 50,000 bags of coffee annually into plastic molding compounds and by-products. The government also purchased a license under the Polin patents and the trademark "Cafelite."

2. PLASTIC MATERIALS INDUSTRY

The principal plastic industry in Brazil has been galalith, for which milk is the raw material. Hard rubber has always been of some significance inasmuch as the raw material is obtainable in quantities in the Amazon valley, but it has never been industrialized on a scale equal to the possibilities.

The plastics industry is still on a small scale and consists of some one hundred and thirty organizations equipped for molding. About sixty of the factories are in the state of São Paulo, and forty are in the Federal District. The rest are scattered, principally in Minas Gerais, the large dairy products and casein center. With few exceptions, the molding companies are small, with antiquated or homemade equipment. Yet the industry grows about 30 per cent annually, and much of the growth is in new capital and modern equipment. Another disadvantage of this industry in Brazil has been the relatively high price of the raw material—partly because it has to be imported, and partly because domestic production is small. Casein production has not advanced so far as in Argentina, because of the greater interest in the traditional dairy products, butter, cheese, and milk by-products.

The imported raw materials (usually of the phenol formaldehyde, urea formaldehyde, and cellulose acetate types and a special German galalith) range in price from fourteen milreis per kilogram upward. The principal sources of these molding compounds, in order of importance, are Germany, England, Italy, the United States, and Japan. Compared to the above compounds, the galalith of Minas Gerais averages 8.4 milreis per kilogram in normal times while casein is a little more than three milreis per kilogram.

In general, the tendency in Brazil is to cut down the imports of plastics, both raw material and manufactured articles. In 1938, these totaled 521 metric tons (valued at 20,600 contos); in 1939, 450 metric tons (21,000 contos); in 1940, 442 metric tons (19,900 contos). Films rank first in these imports (8,000 contos in the 1940 total); celluloid toys are second (2,100 contos), and fresh film, third. Despite the increased production of the domestic movie industry, which, besides releasing several feature films in the Portuguese language during the year, produces innumerable "shorts" and newsreel film which tends to augment annually, the imports of fresh film show little increase: 20 tons in 1938, 17 tons in 1939, and 18 tons in 1940. The showing of one national film, usually a short news feature, during each movie program is required by law and has done much to develop the industry within the country. It may be noted, in addition, that celluloid in semimanufactured form is imported in decreasing quantities while Bakelite tends to increase.

At present, the principal articles molded in Brazil are electrical and insulation devices (including telephones and telephone parts), dishes, buttons, novelties, stationery supplies, bottle caps, and ash trays. With cafelite available at a price below that of the imported plastic molding compositions, it is believed that this industry in Brazil will undergo a marked change, and that the product will be found useful for wall, floor, and furniture parts, and other large-volume industrial

applications. That cafelite will furnish a low-priced raw material has been proved by careful investigation and by actual tests, even after paying the coffee grower a good sum for each bag of "sacrifice" coffee. The low price is well under that of any other plastic molding compound available in normal times in the world market, the price differential being approximately two to one. Part of this advantage arises from the salability of the by-products of cafelite making:

1. *Caffeine*, which has a growing world market and, in normal times, a well controlled world price.
2. *Coffee oil*, which may be sold in practically the same markets as cottonseed oil with a small margin of profit and (slightly modified in composition) may be used as a substitute for palm oil in the tin-plate, the paint, and the chemical industries.
3. *Cellulose*, which would find a ready market in Brazil in view of the heavy imports of this at present.
4. *Furfural*, derived from a treatment of the pentosan content of the cellulose.

In the world market these by-products have been accepted as valuable; in Brazil they not only make cafelite cheaper but are important in themselves. For instance, through them Brazil will be the world's largest and practically sole source of caffeine. The industrializing of coffee involves an annual consumption of five million bags, which will produce approximately 2,500 tons of caffeine—an amount far in excess of the world's present consumption of this material. This by-product can be separated from the coffee and refined at a fraction of the present production cost of caffeine, so that many markets will be open to it and it can be put to many uses for which it has been too costly.

The largest use of caffeine is in beverages. In the United States more than a thousand drinks of the Cola type, made under varying trade names, all contain caffeine. The drug and pharmaceutical trades throughout the world consume about 500 tons of caffeine annually, while a smaller amount

is absorbed by the chemical and industrial markets. It has often been pointed out in industrial circles that caffeine could be utilized in numerous other fields, but its cost has always stood in the way. In Brazil, at the excessive price of 50 to 250 milreis per kilogram, free of duty, it has been impossible to broaden its uses.

The chemical process by which coffee is transformed into cafelite and its by-products is as follows, in the words of its discoverer:

The chemistry of the conversion of the coffee bean to a plastic molding compound derives from the wide variety of resin-forming materials found in the bean. These are sugars, tannins, aldehydes, oleic and linoleic compounds, acrolyn and the polymers of acrolyn, proteins, etc., with the balance composed mainly of cellulose, an advantage to any plastic material. The steps in the conversion include the extraction of the oil, which is fractionated to separate the more useful of its components, the introduction of a catalyst in combination with the cellulosic and protein containing mass, the steam mixing of this with the selected fractions of the coffee oil, the introduction of this mass into an autoclave, the temperature of which is raised and the pressure increased until the mass begins to react, then vacuum drying, which concludes the operation.

The mass which issues from the dryer is a powder which has undergone two stages of a three stage polymerization process. The third stage of polymerization is effected in the press when the material is molded. The resin is a difficult one to type inasmuch as it is a composite of all of the reactable materials contained in the bean. It is this coordinate character which is responsible for its ready compatibility with other types of molding compounds and other extraneous materials. While the coffee plastic alone has all of the properties which make it suitable to some plastic applications, by combination with other materials, special properties are imparted to it. Thus, the addition of 10 per cent of Brazilian rubber latex to 90 per cent of cafelite, when pressed, makes an ideal floor covering, having some of the properties of rubber, desirable for a floor, and some of the properties of a plastic tile, harder and more resistant to abrasion than rubber. Its cost is substantially below that of rubber in

tile form. Other materials, apart from other molding compositions, with which it has shown advantageous combining properties are the Brazilian products, mica, fibers, carnauba, etc.

The chemistry of the coffee bean, processed in accordance with the Polin developments and patents, includes methods for the separation of the proteins, production of fibers, production of furfural, modifying the oils and its fractions to produce rubberlike and resinous materials, the isolation of chemical indicators, a lachrymous volatile oil, a colloidizing agent, etc.

The Departamento Nacional do Café set five million bags annually as the capacity for its projected cafelite plant, partly on the basis of stock now on hand and partly on that of anticipated production in excess of the world's demand in future years. The cafelite program calls, first, for the permanent reduction of excess supplies of coffee and, secondly, for the development of cafelite and its by-products. Thus, the objective is the stabilization of the price level of coffee and the breaking down of the tendency toward the creation of an artificial trade in this product.

The projected large-scale plant, which will be constructed in São Paulo—the center of the coffee district—as soon as every angle of the problem is solved by the operation of the pilot-plant, will cost three and one-half million dollars. It is estimated that the plant will begin operating in about a year if everything goes according to plans. Those plans also call for the sale of the cafelite in the noncompetitive markets, relying largely upon the fact that the product has a unique capacity for admixture with many other plastics so as to make a cheaper product than the higher-priced synthetic resins with which it is combined. The latter will, in the majority of cases, be the phenolic and urea types and will no doubt open new fields for the new combination product. Thus, it is expected, that about 90 per cent of the total output will be exported.

3. EXPORTATION

Although still small, the exports of plastics from Brazil have risen from 56 contos in 1938 to 78 contos in 1939, 1,419 contos in 1940, and 3,124 contos in 1941. Outstanding among the products are those manufactured of ebonite such as combs, brush handles, and pins (1,338 contos of the 1941 total). After them came galalith products (908 contos).

4. CONCLUSION

The prospect which cafelite offers for the future of the plastics industry in Brazil far outshadows any development up to now, so that it would be useless to try to compare the past and the future. That the availability of a low-cost molding compound in Brazil will inspire the enlargement and modernization of the molding industry is beyond doubt. The adaptability of cafelite to combination with rubber, carnauba, and bast fibers is also another factor which should tend to stabilize other industries, particularly farming, which will no doubt be subject to severe changes with the termination of the present hostilities. The opening of a large-scale plant making a variety of by-products will provide ample opportunity for the training and establishment of a "skilled and technical hands group." These advantages, however, seem small now in comparison to the single feature, the withdrawal of surplus coffee from the market. The importance of this lone factor can hardly be realized without "living" the coffee overproduction problem as Brazil has done for many years—growing over two-thirds of the world output and burning approximately one-fourth of her total output.

XII

RUBBER MANUFACTURES

1. GENERAL SURVEY

THE birthplace of the rubber industry was the Amazon valley. Whether it was the first industry in Brazil, however, is open to question inasmuch as the same natives who established the rubber industry also wove textiles of the wild arboresous cotton before Brazil became Brazil. The principal rubber articles were shoes and water containers. Many years later, about 1759, the Portuguese who colonized the North sent to the king in Portugal a garment made of rubber which writers of the time described as "surprisingly comfortable and practical," saying that "with it one may keep dry." Forty years later, the rubber manufactures exported to Europe and the United States included such items as shoes, rubber containers for water, and powder and tobacco pouches. The first shoes were modeled after the Chinese types and were gilded despite their being destined to Boston in the United States. At times shipments rose to as much as five hundred pairs in answer to the increased demand for the new product—a costly curiosity sold at five dollars a pair.

In 1800, the year of the first shipments of crude Amazonian rubber to the United States, there was born in that country a man who made rubber history and "democratized" the product of a dozen uses to one of more than forty thousand applications: Goodyear. True, rubber had been made into coats before Goodyear; but it did not resist the cold and heat. At the age of thirty-nine, he discovered the process of vulcanization, by which the product became able to with-

stand changes in temperature. Soon many new industries sprang up which made boots, shoes, and galoshes of vulcanized rubber. The latter, at the time, was termed "elastic metal."

It is obvious that with vulcanization rubber entered a much more complex phase and was about to qualify as a branch of the chemical industry. The Brazilian producers were unprepared for this, and the industry failed to develop. With respect to rubber, then, Brazil concentrated on extracting the crude latex and buying the finished goods. For many years Brazil led the world in the production of latex. However, it lost this position early in the present century with the appearance of plantation rubber; and only in the last decade has there been any semblance of a comeback in the industry, with a beginning at the production of plantation rubber and with the manufacture of numerous rubber articles—many of them on such a scale as to tax the supply of Brazilian raw material. The modern factories are found not only in São Paulo and the Federal District but also in Pará in the extreme North and in Rio Grande do Sul in the extreme South.

Figures on the Brazilian production of rubber articles are hard to come by. The best to be had are incomplete, based on the consumption tax. This limited survey places the total value at 41,000 contos in 1938, 53,000 in 1939, and 103,000 in 1940.

2. DISTRIBUTION OF PRODUCTION BY STATES

The Federal District produced last year 55 per cent of the national output. The industry in São Paulo which was until recently in its initial stages, produced 30 per cent. Pará's production was 8 per cent of the total while that of Rio Grande do Sul was 7 per cent. With its new installations São Paulo came to first place in the manufacture of rubber products.

In the Federal Capital, the 1938 output of 22,000 contos included 16,000 contos of automobile tires—an important and appropriate industry for the country that is the largest producer of "native" rubber and the fourth largest of raw cotton. The industry in São Paulo has for its principal products tires, tubes, raincoats, belts, caps, aprons, and sheet rubber. Pará is important in tires and in vulcanization, while the manufactures of Rio Grande do Sul are principally rubber tubing and raincoats.

3. SELF-SUFFICIENCY IN MANUFACTURES

Within limits, Brazil is self-sufficient in supplying the domestic demand for rubber manufactures. Numerous products still imported can be replaced by national products; that many such have been replaced in recent years is evident from the following data on imports: 1928, 5,300 tons; 1936, 2,200 tons; 1939, 450 tons; 1940, 460 tons. These data do not include the overseas purchases of rubber tires and tubes—which also have been reduced, from 4,500 tons in 1928 to 3,000 tons in 1940.

The raw materials consumed by the national industry are domestic in great part, the rubber being from the Amazon, the kaolin and also the mineral coloring matter from the southeastern states. The accelerator is imported from the United States and Germany while the former also furnishes a large part of the lampblack. Chile is the principal supplier of sulphur.

4. VARIETY IN PRODUCTION

The rubber goods output is characterized by variety in products and in types. In types, there are soft rubber, hard rubber, and transparent. In products, tires and tubes, sheet rubber, ebonite, desk and stationery equipment, hot-water

bags, mats, vulcanite, tubing, rubber balls (plain and colored), heels, conveyor belts, impregnated cloth, syringes, combs, rulers, battery cases, gloves, and balloons are among the more important.

Quite recently installations for a new plant to manufacture rubber conveyor belts have been completed in Brazil by the Goodyear Tire & Rubber Co.

The annual consumption of crude rubber by the Brazilian industry is estimated at more than 4,000 tons, and the rapid growth of the industry has made necessary limitation of exports in order to guarantee the supplies indispensable for the development of domestic manufactures.

The manufacture of tires and tubes formed nearly half of the industry in 1938; and this percentage increased to some extent in the following years, for the output which was valued at 19,600 contos in 1938 rose to 28,000 contos in 1939. More than 90 per cent of the national output is produced by São Paulo and the Federal District. Pará manufactures the rest. These figures include tires and tubes for motorcycles and bicycles as well as for automobiles. The industry began in 1927 with the production of six tires and tubes; the annual output now exceeds 500,000.

The production of rubber sheets and tubing is more or less evenly distributed among Rio Grande do Sul, São Paulo, and the Federal District, with respectively 37, 34, and 25 per cent of the national total.

5. EXPORTATION

The exports of rubber goods rose from 17 contos in 1938 to 255 contos in 1939, 344 contos in 1940, and 1,375 contos in 1941. Pneumatic tires led in value while the classification "stationery and school equipment and articles" came second. Sheet rubber, inner tubes, and other unspecified articles

make up the remaining shipments. Most of these exports are to the South American market.

Although hopes for increases in exports are high, it is the general opinion that the greater use of automobile tires within the country will diminish these. The ratio of trucks to automobiles in Brazil is exceedingly high—in fact, next to the highest among the fifteen leading automobile countries in the world—and tire manufacturers must look forward to a different type of demand in planning their production for the year. This in turn necessitates an unorthodox adjustment to the demand situation, with the export market assuming the role of an outlet for surpluses rather than an objective of production. In addition to the ordinary adjustments which must be made in the export trade of this product in normal times with the rise of domestic manufactures, the war makes it urgently necessary to direct the industry so as to satisfy Hemisphere needs. Regulation of exports of crude and manufactured rubber is indicated, for the greatest benefit from shipments of the former.

6. CONCLUSION

Probably no single product demonstrates more clearly than rubber the ups and downs of Brazil during its four and a half centuries of existence. Before the Industrial Revolution, with a rich variety of raw materials, Brazil was of vital importance as a source of commodities for the large population centers abroad. With the abrupt modifications which came in the wake of the machine and chemical age, the abundant raw materials still had a ready market in the industrial centers, and no change was required in Brazil—raw materials continued to be exported, and the finished goods imported. But this made difficult the continued existence or growth of domestic manufactures. Rubber in Brazil had

this very history. With abundant raw material in Brazil and an important world industry, the changes that came with vulcanization did not stir Brazilian initiative, and the country remained a source of *crude rubber*, without developing in the *manufacture of rubber articles*.

Later, with the rise of other raw-material centers, and the consequent need to retain markets, Brazilian raw materials had to be improved in order to maintain the country's position. Then the World War of 1914-18 had profound effects in Brazil, permanently modifying a majority of the industries. Rubber was among these, and made its first forward stride under the influence of the Industrial Revolution days. The raw material now found a new outlet—the domestic manufacturing industry—along with many other Brazilian raw materials. In the postwar years the renewed competition of the industrial nations reacted unfavorably on Brazilian manufacturing as a whole. With the Coffee Crisis and the reduction of the value of the milreis Brazil was forced to rely more and more on her own resources, resorting to measures which would aid domestic industry and the use of domestic raw materials—a program which is in full effect under the long-sighted policies of the present Administration, and which, in the rubber industry, is faithfully observed both in policy and in its record of production.

XIII

PAPER AND PRINTING

1. GENERAL SURVEY

THE development of printing was arrested in colonial times by the restrictive measures of the Portuguese authorities, who sought to prevent the spread of liberal ideas in Brazil. The influence of the Church also was against the establishment of many printing shops. There are records of only two of these in the colony—one in Pernambuco in the early eighteenth century which issued mainly religious works, and the other in Rio de Janeiro, founded in 1747. Both were closed by the police, their equipment and material confiscated and sent to Portugal. Strangely, the action of the authorities was based on a law of Portugal that made it a crime to set up a shop in Brazil for the printing of anything except playing cards.

The transfer of the Court of Lisbon to Rio de Janeiro completely modified the situation. Through the Portuguese Minister of Foreign Affairs and War—Antonio de Araujo Azevedo, later the Count of Barca—two printing presses and twenty-eight cases of type were ordered in London for the Impressão Regia de Lisboa (Royal Press of Lisbon). The printing presses had just reached port on the ship *Medusa* when suddenly the Lisbon government came on board and she was ordered to Brazil. Sailing again, the *Medusa* unloaded the printing equipment, valued at one hundred pounds sterling, in the city of Rio de Janeiro.

By authority of the Royal Charter of May 13, 1808, the

Impressão Regia was founded, primarily for the printing of decrees, orders, notices, and other government publications. It encountered numerous difficulties, principally the lack of trained printers. Finally several soldiers of the Brigada Real de Marinha were found who had learned the trade in Lisbon. One of the first publications to appear was the *Gazeta do Rio de Janeiro*. However, strict censorship impeded the expansion of the press.

After the attainment of independence in 1822, numerous publications appeared, and the number of printing shops increased surprisingly. Among the journals of that time, the *Jornal do Comercio* of Rio de Janeiro and the *Diario de Pernambuco* of Recife in Pernambuco still exist; and other important dailies of the present are almost as old. Those of the Federal District, São Paulo, and Porto Alegre generally had their own plants with modern machinery and type, and did job printing on the side.

The output of the paper and graphic arts industries was valued at approximately 611,000 contos in 1939, and 770,000 contos in 1940. Of the 1938 production, valued at 520,000 contos, 56 per cent was from the state of São Paulo, divided as follows: 150,000 contos of paper and paper articles and 140,000 contos of printed matter. The Federal District ranked second with 19 per cent of the national total: paper and paper articles, 44,000 contos; and printed matter, 55,000 contos. Among the other states, Estado do Rio had 7 per cent of the national total (36,000 contos of paper and 1,400 contos of printed matter); Minas Gerais had 6 per cent, and Pernambuco 4 per cent.

Despite their historical renown, the cities of São Salvador and Recife in Bahia and Pernambuco have lost ground to the new and more populous centers in the Southeast. Rio de Janeiro and São Paulo in this section are favored not only by density of population but also by the greater dissemination of culture and religion. Rio de Janeiro stands

high among cities in the ratio of daily newspapers to number of inhabitants. In addition to the large newspaper industry, the two cities have large general publishing and printing industries—the majority of the publishers gathering in the Federal District, where there is also a concentration of writers due perhaps to the fact that the Federal District is the political center of the country. The competition of the two literary centers seriously affects the printing industries of neighboring states, particularly Estado do Rio, which is situated between these two.

2. PAPER

The first paper mill in the country was brought about by a prize offered by the Emperor, Dom Pedro II, in the last quarter of the nineteenth century. In the first years of the present century the industry was still far from sufficient to meet the nation's needs. The World War of 1914-18 gave the industry a stimulus that was lost again after the war. In 1926, however, the domestic output of paper and paper articles rose to 18,000 tons, of which 6,000 was made in the Federal District and 3,000 each in São Paulo and Estado do Rio. The national production rose to 32,000 tons in 1926, 97,000 tons in 1938, and 119,000 tons in 1939. São Paulo has the largest production today (50 per cent of the national total), and Estado do Rio is third with 17 per cent.

The annual consumption of old paper and waste rags in paper manufacture is considerable—estimates run as high as 60,000 tons. Wood-pulp production is exceedingly small, and only three factories are in operation: one in São Paulo using pine and eucalyptus from that state and Minas Gerais; another in Paraná using the famous Paraná pine. The São Paulo plant has an output of 900 to 1,200 tons, while the Paraná produces 1,800 tons of cellulose and 7,400 tons of pulp. The third factory, in Estado do Rio, has an

output of but 400 tons. These firms fail to satisfy sectional needs, to say nothing of national necessities. Thus large imports of wood pulp are required—85,000 tons in 1939 and 64,000 in 1940. The decrease in 1940 has little connection with domestic production and was chiefly caused by wartime difficulties.

Tests have shown the feasibility of utilizing rice straw, but there is little reason to believe that this presents a permanent solution to the problem. Greater possibilities are offered by the carnauba leaf after its wax has been extracted. This leaf, now rarely used except in making straw mats or thatching roofs, can be treated chemically so as to yield "wood pulp" which, when bleached by the ordinary processes, becomes snow-white. Because quantities of these leaves are now discarded in the wax extraction process, it is believed that they offer a possible solution of this great problem in Brazil. Not only a solution of the wood-pulp problem but also a significant social-economic contribution to the welfare of the Northeast (where the carnauba grows), one of the "forgotten" places in the distribution of natural wealth in Brazil. Waste caroá fiber, also from the Northeast, provides cellulose of a higher quality than carnauba and is used in the fabrication of finer papers, including the light airmail paper. The possibility of paper from sugar bagasse is under investigation—this source being important for a country whose output of sugar ranks fifth to sixth in the world, and of sugar cane, second.

The heavy imports of newsprint have always presented a difficult problem. There are some newsprint manufacturers in Brazil, particularly for the journals of the hinterland, but their comparatively small output has had little effect on the general situation. Early in 1942, however, *A Noite*, one of the three largest evening newspapers in Rio de Janeiro, surprised its readers by beginning to appear on 100 per cent Brazilian-made paper. The plant that makes

this newsprint is in Paraná; its paper has an even and neat texture and is whiter than that used by other Rio de Janeiro newspapers.

Of the 53,000 tons of paper imported in 1940, nearly 46,000 tons was newsprint. The annual rise in purchases, as well as in their unit prices, has led the government to take an active and direct interest and resulted in the plan to establish a large-scale wood-pulp plant in Paraná utilizing the pine of that state. The lack of capital was overcome by the Bank of Brazil with a loan of 60,000 contos. Construction has already begun and it is expected that the plant will be functioning within two years. Plans call for an output of 80,000 to 90,000 tons of pulp and cellulose. The standing timber reserve consists of six million trees over a foot in diameter. Laboratory tests of the pine show that four cubic meters of dry wood yield one metric ton of cellulose, and only 2.3 cubic meters are required for a ton of wood pulp.

Tastes in paper vary little from the ordinary in Brazil although it may be noted that demand for stationery in colors is small. Deficiencies in domestic production are clearly indicated in the imports among which the following are the more important: tobacco paper, copy and crepe paper, ledger paper, printing (photographic) paper, cardboard, and carbon paper.

3. PAPER MANUFACTURES

By importing foreign cellulose and wood pulp of the better qualities the paper-making industry of Brazil produces most types of paper articles which do not require complex manipulation. This is one reason why the principal imports are such products as stamps, tissue paper, paper cloth, maps, cigarette wrapping paper, playing cards, chromed paper, almanacs, calendars, newspapers, and magazines. The last four should be grouped by themselves as

printed matter in foreign languages imported in answer to a demand from foreign elements within the country. Despite the lack of foreign-language matter produced in Brazil, some imports have been reduced with the war, especially those from France and Germany. In their place now is matter in the English language called into being not only by the rising Pan-American sentiment within the country but also by the advances of the American film industry, with its technicolor and its advanced film technique, in the Brazilian field, which was once shared with French, German, and Italian films. On equal footing also is the interest manifested in American business administrative methods as applied to technical control of commercial and financial enterprises.

Although imports of paper continue, there is a domestic production of all such products. Imports of tissue paper, for example, average 500 tons: the 1936 production, including oiled paper, was 5,000 tons; the 1938, 7,000 tons, and the 1939, 11,000 tons. Of the 11,000 tons, 8,000 was produced by São Paulo, and 1,000 each by the Federal District and Estado do Rio.

With the feverish construction of new homes and multiple story buildings in São Paulo and the Federal District, the use of wall paper has diminished, and its output dropped from 500,000 pieces in 1929 to 178,000 in 1939. The Federal District leads in this production, with 161,000 pieces of the 1939 total.

A phenomenal increase has been observed in the manufacture of stationery paper. From an output of 1,800,000 boxes in 1930, Brazil advanced to 4,030,000 in 1936 and 12,000,000 in 1939.

In spite of the general failure to produce paper requiring special processing, there was an output in 1939 of 10 tons of photograph paper; and cloth-reinforced paper has a production of about 17 tons per year.

4. NEWSPAPER AND BOOK PUBLISHING

The progress or the backwardness of the publishing industry of a nation depends on its cultural development. A large paper industry also is an indication of an elevated educational standard. The development of the paper industry of Brazil has not been discouraging. However, the disparity with what might have been accomplished by an industry on a par with that of other leading countries, no doubt, played a part in bringing to the fore the problem of wood pulp and cellulose, the solution of which is to be expected in the very near future. The weakness of the present situation is in the necessity of importing foreign raw material, which raises the cost of the paper. Despite the reduction by the government of the tariff duty on newsprint, for example, the general rise of over 300 per cent in the last ten years has done much to vitiate any resultant gain.

While the newspapers enjoy this reduction, periodicals and books do not, and must depend upon the domestic paper made of foreign pulp. The advantages gained in low cost of typesetting are offset by the cost of the paper, which is usually 40 per cent of the wholesale price of a book. An added economic burden is laid on publishers by the rapid extension of education and the resultant enormous demands for published works in general not to mention great numbers of textbooks.

Most of the progress in book publishing has been since 1930. Until that year, the Brazilian elite, with access to imported books made easy by the high price of coffee and the strong exchange position of the milreis, read French literature almost exclusively. Brazilian publications were thus greatly circumscribed, and books by Brazilian writers were published usually at the author's expense, so that for a long time poetry dominated the market.

The 1930 Revolution, bringing a violent upset of the national government, coincided with the world economic crisis, which was featured by a sharp drop in the price of coffee and the rise of the franc to 1,200 reis, or about four times its former value. On this favorable turn, the Brazilian publishers went to work with renewed vigor. The new ideas and new hopes brought in by the new administration created a deeper interest in things "at home." The themes of the day were, however, politico-social problems and their solution, whether the form of writing was essay, romance, or poetry. This sudden interest which swept the country brought the foundation of publishing houses in scattered regions; but the centers of publishing are still the cities of Porto Alegre (Rio Grande do Sul), São Paulo, and Rio de Janeiro.

The present war has brought another development in this industry—interest has shifted from French to English language publications. This has a variety of causes, as has been said; however, the appearance of pocket-size editions on the market clearly suggests another possible cause, low-priced books. Many American works are on the same price level as French or Spanish works. Another important cause has been the turning of Brazilian youth from *belles-lettres* to the sciences. This shift in reading is borne out by the fact that one of the largest bookstores of Rio de Janeiro purchased \$12,000 worth of American books in 1939 and more than \$111,000 worth in 1940. In fact, the Brazilian imports of books and printed matter from the United States reached \$521,000 in the first nine months of 1942 as compared with \$248,000 during the whole year of 1940.

5. EXPORTATION

Until 1939, the principal Brazilian exports of paper and printing were, first, newspapers and magazines and, second,

books. In 1940, however, there was a sudden change and paper became nearly half of the total exports. The principal markets for the literary items are in South America while newspapers, magazines, and literature in general go principally to the Portuguese-speaking colonies in Africa or to Portugal.

6. CONCLUSION

The outstanding characteristic of the paper industry is the manufacture from imported wood pulp of most of the paper consumed in Brazil aside from newsprint. This would still continue but for the Vargas Administration—which advocates utilizing Brazilian raw materials as far as possible for Brazilian products. Without the typical wood of North America, where most of the world's wood pulp is produced, it was thought that Brazil had no hope of a paper industry. The development in the United States of Southern pine, however, suggested the possibilities of Paraná pine in southern Brazil. Since that time, various experiments have been conducted, and there have been successful results not only with the pine but with eucalyptus, carnauba straw, leaves of banana trees, sugar bagasse, and caroá fiber. Theoretically all are possible raw materials; they give the industry new horizons and may free the country from the necessity of importing huge quantities of wood pulp. Incidentally, the South again triumphs in securing the new plant to be established for making wood pulp from pine. The Northeast, less progressive economically but rich in carnauba straw, sugar bagasse, and caroá waste fiber, thus continues its former march characterized by a certain lack of initiative which represents one of the most interesting anomalies of the Brazilian economy of today.

XIV

WOOD PRODUCTS AND FURNITURE

1. GENERAL SURVEY

INCLUDED in the so-called "economic cycles" of Brazil is that which is known as the "Páu-Brasil" or Brazil-Wood Cycle, the earliest of a series which counts those of Gold, Sugar, Diamonds, Rubber, and Coffee. And, even through these subsequent cycles, wood has never failed to be of importance both in the home market and in the foreign trade. Most expressive of this significant role in Brazilian economy played by wood and timber is the fact that the forest area is the second largest in the world and includes not only the tropical hard and soft woods but also those of the temperate zone—the latter being the more important in the present day.

Yet despite this natural abundance of timber supplies, Brazil until recent years depended heavily upon foreign wood. This, in statistical data, is shown by the fact that in 1913 the imports of timber and semimanufactures of wood (excluding wood pulp) amounted to 164,000 tons; in 1930 this had decreased to 4,900 tons, and in 1939 to 1,300 tons. The 1940 imports rose sharply to 3,260 tons with the importation of 1,800 tons of quebracho timber from Paraguay—raw material for quebracho extract, used in tanning. (Imports of the extract were reduced from 2,000 tons in 1939 to 714 tons in 1940 as a result of the increased importation of the quebracho wood.)

While raw-material imports have declined 92 per cent,

manufactures have declined 87 per cent. Imports of manufactures amounted to 3,900 tons in 1913, 523 tons in 1939, and 489 tons in 1940. The principal manufactures which continue to be purchased abroad are, in order of importance, wooden parts for textile machinery, toothpicks, spools, and toys. Semimanufactures still imported are planks, board, and small wooden machinery parts. Imports of staves and hoops, sleepers, box shooks, corks, barrels, casks, desks, and lockers are at a standstill.

Besides tropical and temperate zone woods, Brazil has woods ranging in density from the lightest to the heaviest, with grain which permits some of the most unique and beautiful combinations that have ever been arranged, and with resistance to insect and weather action; and there are quantities of all these varieties, so that a large wood and lumber industry is possible. Yet this has not come into existence, for one or more of three reasons: no production; production in too small a quantity to influence the imports; failure to allow for proper seasoning of the wood. These three weaknesses of the lumber industry are less in evidence in the South, where the climate is more favorable to lumbering.

The national production of articles of wood and furniture was approximately 897,000 contos in 1938: the state of São Paulo produced 54 per cent; the Federal District, 11 per cent; Minas Gerais, 8 per cent; Rio Grande do Sul, 8 per cent; and Paraná, 7 per cent. In São Paulo about 82 per cent of its total was furniture, while sawed, trimmed, planed, etc., boards were 11 per cent and articles of wood, 7 per cent. Furniture was 65 per cent of the Federal District total, while other small articles of wood were second. In Minas Gerais, the situation is different, evidencing the concentration of activity: its total of semimanufactures of wood, principally planks, boards, slats, etc., was the largest in Brazil and was 76 per cent of the state total. Paraná also concen-

trates in the semimanufactures, as might be expected with its large pine industry. Its output of these semimanufactures was valued at approximately 35,600 contos while that of the leader, Minas Gerais, was 58,900 contos.

From a production of 900,000 contos in 1938, the national total rose to 1,114,500 contos in 1939, and was estimated at 1,230,000 contos in 1940. Increased production may be attributed to several causes, among them the increased fabrication of furniture and the large amounts which are being consumed in home and building construction, the latter being particularly heavy in the cities of São Paulo and Rio de Janeiro. Statistics show that the number of small homes constructed is relatively higher in the former city and that of multiple story buildings in the latter.

2. FURNITURE

The manufacture of furniture is well developed throughout the country but there is still an appreciable amount of coastwise trade in it—which indicates the lack of certain items in some regions, particularly the Northeastern states. São Paulo is the principal exporting state and produced 73 per cent of the national total in 1939. São Paulo has long been the dominant state in this industry; it not only has large forests within its boundaries, but draws upon the two neighboring timber-growing states, Minas Gerais and Paraná. The principal types from Minas Gerais are aroéira, ipê, peroba, páu-setim, jacaranda, and small quantities of cedar and canela. From the latter state, the principal wood imported is Paraná pine.

The second state in furniture making is Rio Grande do Sul with 9 per cent of the total, depending largely upon its own timber resources. Its output ranked second in the 1920-29 decade, but it fell to third, behind the Federal District, in the earlier part of the 1930 decade, regaining

second place in 1939. The Federal District produces variety while the significant feature of the São Paulo industry may be said to be quantity. Thus in the Federal District there is an importation of wood from a greater number of sections of the country than there is in São Paulo.

Paraná had an output in 1939 of 18,180 contos (3 per cent of the national total); and Minas Gerais, 11,400 contos (2 per cent).

3. ARTICLES OF WOOD

There are no official data on the output of articles of wood in Brazil, but it may be estimated from certain indications at 100,000 contos. About a third of this output comes from the state of São Paulo. Significant among this state's products are boxes and cases, which exceeded three and a half million units in 1938.

The output of its sawmills, which does not enter into the above total, was valued at more than 50,000 contos. A partial list of the principal products of the state indicates variety as well as differing degrees of technique necessary in production, and the progress of the industry in the state: pulleys, barrels, shoe forms, spools, shuttles, plywood, picture frames, tool handles, and spindles.

The Federal District is second in importance in this industry, and in 1938 had an output valued at 20,610 contos. Third comes Paraná with 20,200 contos, no small part of which is represented by box shooks of pine. Rio Grande do Sul and Minas Gerais follow with 14,215 contos and 9,290 contos respectively.

4. EXPORTATION

The larger part of the increase in exports of approximately nine times in the 1938-40 period is attributable to

the war in Europe. The Scandinavian countries, which in ordinary times provided much of the world supply of box shooks and plywood, left the market to other countries; and the Brazilian lumber industry benefited greatly inasmuch as 88 per cent of the 1941 exports of wood manufactures, valued at 24,216 contos, consisted of these two products: box shooks, 11,171 contos; plywood, 10,223 contos. The 1940 exports were valued at 14,048 contos; 1939, 2,902 contos; 1938, 1,540 contos.

Until 1940 broom handles led the list of exports of wood manufactures, of which they formed 82 per cent in 1938. In 1939 plywood and pencils made their first appearance among the exports, ranking second and third. Both of these products made substantial advances in 1940 and 1941, taking the lead from broom handles, but themselves yielding the lead in 1941 to a still newer product, box shooks.

5. CONCLUSION

In a retrospective glance at the utilization of the country's timber resources, progress seems to have been concentrated within the last three to four years. Brazilian timber long went principally into exports. Manufactures were mostly imported, and production was generally limited to the smaller or semifinished articles. Even these items were produced only as needed. Their workmanship was good, and it would not be fair to say that the present-day articles are better. The greatest change has been in quantity production, variety being of secondary importance; and this has come in the years since 1937.

Frame houses are not common in Brazil as they are in North America; but two years ago a company in Paraná began constructing prefabricated houses, which are shipped to Petropolis, a summer resort near Rio de Janeiro, where great interest has been shown in this type of dwelling. The

Federal Government is studying a plan to finance them as homes for industrial workers.

A new development is the creation of a control board for Paraná pine. It is early to determine the merits of this body and its influence on the future course of the industry. The opening of the woodpulp and cellulose plant in Paraná will no doubt increase the valuation of the already highly prized Paraná pine.

With regard to manufactures and semimanufactures, little has been done. The principal development has been the new large exportation of box shooks and plywood, a considerable part of which is attributable to the government subsidy given to the South African line of the shipping company, Lloyd Brasiléiro.

As to the future, a disquieting possibility is the exhaustion of the Paraná pine; but estimates allowing for a reasonable reforestation program indicate no threat to the lumber industry. The standing reserves of this pine in the South are enormous. The success in obtaining cellulose from sugar bagasse and carnauba straw is another protection to Paraná pine.

Wood, in many applications, will no doubt face stiffer competition from the metals and from cafelite and other plastics. Despite the large exports and considerable trade in wood, there is no trade association to foster the development of the industry and protect its interests. Another weak point is the failure to push an energetic export program by which the world would be brought to realize the beauty of the grains of the woods of Brazil—beyond question, in a class by themselves.

The emergency brought about by the war has enormously increased the use of wood as a fuel, in place of the coal hard to get in sufficient quantities from the United States. This is of course just a temporary condition, as the fuel problem of Brazil will be no doubt—and very soon—solved by a larger

use of electricity, of its national coal, and of the petroleum from Bahia. The wealth of our Brazilian forests will then be put to more intelligent uses, profiting from the far-reaching revolution which has taken place in the utilization of wood.

XV

TOBACCO

I. GENERAL SURVEY

THE smoking of tobacco was introduced into Europe in the middle of the seventeenth century. It is said that the French ambassador in Lisbon, Nicot, was the first to use this product in his country. Brazil enters into this historical occurrence through Father Thivet, who had passed some time in Brazil and later wrote a book asserting that he, and not the French diplomat, had introduced smoking in France.

In earlier years Brazil was the largest grower of tobacco and one of the most important suppliers. Tobacco then was second among Brazilian exports, and the shipments in the colonial period (1500–1822) are estimated at more than £12,000,000.

Today, tobacco is relatively less important in Brazil although the country still ranks fifth in production and sixth in exportation. Brazil's importance in the growing and exportation of the leaf does not extend to tobacco manufactures. Here it has never equaled Cuba and the Philippines in cigars or the United States, Turkey, Egypt, or Bulgaria in cigarettes. However, the industry is not unprogressive. Measures have been taken to induce the substitution of domestic tobacco for the imported—both leaf and finished product. The Ministry of Agriculture has sought to develop different types of plants suited to the various climatic zones of Brazil that will produce the various foreign leaves and thus free the local manufacturers from the need of im-

porting from foreign sources. This is one of the most striking evidences of the forward and progressive policy adopted by this governmental body. Nor have the manufacturers been indifferent. In cigarettes, there are the "American," "English," "Continental," etc., just as in cigars there are the "Cuban"—all made to satisfy the demand for a certain taste and flavor.

Output of tobacco products was valued at 315,600 contos in 1938, 298,700 contos in 1939, and 328,000 contos in 1940. The large production of cigarettes is concentrated in the South. Cigars rank second and center in Bahia, while the making of snuff, plug, and pipe tobacco, which is of very little importance, is scattered.

São Paulo is predominant in the tobacco industry with approximately 39 per cent of the national output, while the Federal District has 26 per cent. Rio Grande do Sul, which produces 15 per cent of the total, holds its position because its tobacco processing industry is the largest in the country (within the state this contributes more than 60 per cent of the industrial tobacco output). This also explains, for example, why the Federal District and São Paulo have large outputs of tobacco products without an equally important production of leaf tobacco. Bahia, traditionally important in this industry, produces 6 per cent of the total and is closely followed by another northeastern state, Pernambuco.

2. CIGARETTES

Brazil produces practically all types of cigarettes, and is gradually substituting domestic leaf for imported. The great variety of leaves available within the country makes possible various combinations to suit smoking tastes, and it is not uncommon for a company to produce three or four different brands; in fact, one of the largest companies makes about ten brands. Yet it is rare for a smoker buying a package

of cigarettes to indicate his wishes with such terms as "mild," "smooth," "Turkish," "cool," or "mixed." This probably results from a failure in advertising by the manufacturers rather than from lack of desire in the smoker. The use of cigarette pipes is rare.

The Federal District leads in production with 239,910,000 packages, or 38 per cent of the 1939 national output of 637,900,000 packages. Its advance from second position in 1938 is attributable primarily to São Paulo's drop in production from 380,501,000 to 180,253,000 packages—28 per cent of the national total. Pernambuco, Rio Grande do Sul, and Bahia followed with 9 per cent, 7 per cent, and 6 per cent. Minas Gerais has made substantial progress in recent years but does not yet appear among the first five. Its great advantage in this industry lies in the ability to produce numerous varieties of tobacco.

In coastwise trade, the principal movement of cigarettes is from the Federal District to the southeastern and northeastern states. São Paulo, although one of the largest manufacturers of cigarettes, has but 2 per cent of the total exports. Rio Grande do Sul, though an important producer, exports but little and has the largest imports.

In other countries huge sums are spent in advertising cigarette brand names, in a great variety of mediums. In Brazil, the lack of such advertising has been noticeable. However, in the last year or two such advertising has come in, beginning with billboards and the insertion of prizes in the packages in the form of redeemable notes which ranged from fifty cents to fifty dollars.

3. CIGARS

The cigar industry for a long period had a continental and even a world reputation. It was established by Germans who settled in Brazil principally to ship the leaf and rolled

tobacco to Germany—the principal market for the Brazilian product down to the present except during the war periods. Later they began to manufacture other tobacco products.

Bahia, the great tobacco producing center, made 74 per cent of the national output of cigars in 1939. Its annual production varies from 120,000,000 to 160,000,000 units subject to the consumption tax. Added to them are what may be termed, for want of a better name, "cigars for local consumption"—which are miniatures of the regular cigars and are produced and consumed in the interior. The number of these is considerable. The *cigarro de palha* (hand-made cigarette with a corn-sheaf wrapper) also is a characteristic feature of the hinterland.

Bahia, besides being the largest producing state, is one of the most consistent in output. This is not true of Santa Catarina, second in rank, with 9 per cent of the total: its output was 11,000,000 units in 1939, as compared to 5,000,000 units in 1937. Other states that enter the record are Rio Grande do Sul with 7 per cent of the national production, São Paulo (4 per cent), and Sergipe (3 per cent). The production of Rio Grande do Sul declined from 7,100,000 units in 1937 to 6,200,000 units in 1939 while that of São Paulo dropped 15,000,000 to 6,000,000 units. Sergipe also showed this downward trend, from 8,900,000 units in 1937 to 4,600,000 units in 1939. This decline in the cigar manufacturing industry was nation-wide, and the national output dropped from 207,700,000 units in 1937 to 160,000,000 units in 1939.

The consumption of the customary cigar (to distinguish from the above mentioned "cigar for internal consumption") has never been large. The principal reason is probably price. A cigar made in Brazil sells for one milreis (about five cents) or more while a package of cigarettes sells for four to six cents. In addition, the large urban consumption of

manufactured cigarettes and the equally large use of the hand-rolled cigarette limit the market for cigars. The comparatively small domestic consumption and the reduction of the export market by the war partly explains the recent trend toward a smaller output. However, it would be unjust to draw conclusions solely from the 1939 production, which as well as that of 1936 was exceptionally large and was only exceeded in the year 1931 when the output reached its all-time high of 245,000,000 units. The general average in the intervening years was 180,000,000 units. This figure may be said to be fairly representative of previous conditions and indicates the general decline which was stressed above.

4. SNUFF, AND PLUG, ROLLED, AND PIPE TOBACCO

Snuff production is today a minor industry of little economic importance. The output amounted to less than one metric ton in 1939, and it has registered an almost continuous decline through the past decade.

Plug, rolled, and pipe tobacco are produced principally in the Federal District; of the national output valued at 14,000 contos, it produced 9,300 contos. Imports of pipe tobacco still exceed the domestic production.

5. EXPORTATION

Brazil continues to be an important exporter of leaf tobacco. However, the same cannot be said of tobacco manufactures. The annual exports, averaging 3,000 contos, fell in 1940 to 2,700 contos as war difficulties beset the industry. In 1941, there was a slight increase to 3,035 contos. The principal products, in order of importance, are twist tobacco, cigars, pipe tobacco, and cigarettes. The amounts

exported in 1941 were 1,550 contos, 980 contos, 285 contos, and 165 contos respectively.

6. CONCLUSION

The struggle of the tobacco industry in Brazil, until recent years, was to reduce imports of manufactures and to introduce national products in their place. That this has been achieved, in the long run, is eloquently proven by statistics which shows decreased imports and a general rise in exports. Further active measures designed to modify the structure of the entire tobacco trade are found principally in the efforts made by the Administration to produce the leaf tobacco now being imported. This applies in particular to wrapper leaf similar to that of Havana. Another positive measure is the more aggressive advertising campaigns undertaken by the manufacturers, whose underlying themes may, in general, be summarized in the following: first, the price feature for the lower grades of cigarettes; second, brand advertising good-will for the better grades without specific mention of quality or type; third, the giving of premiums, usually a note redeemable in cash or articles for the newer brands, in order to attract buyers; and fourth (newest policy), the mention of certain characteristics such as *tipo americano* (American type).

Brazilian tobacco formerly entered the overseas markets principally through shipment of the leaf and manufacture of the finished product in Germany and Holland. Today those countries no longer handle the Brazilian product, and necessarily a new trend is apparent in this industry. Exports of both the leaf and the manufactured tobacco have been encouraged, to alleviate some of the difficulties brought in the wake of the war. To some extent the gains made in the South American market have made up for this loss in the European market. A change of some importance seems to

be due to strictly non-Brazilian causes; namely, the increased consumption by women. Though not developed so far as in other countries, the smoking habit has increased substantially in recent years; among the causes are, first, the movies; second, the presence of innumerable well-to-do tourists in Brazil with the habit of smoking; and third, the increased interest manifested in "things non-French." Formerly the center of interest in matters foreign was France: today other centers have greater appeal to the Brazilian. This may be said to be particularly true of "things American."

P A R T F O U R

B R A Z I L A T W A R

BRAZIL AT WAR

ON AUGUST 22, 1942—when this book had already been written—a treacherous attack by Axis submarines upon Brazilian coastal vessels employed in peaceful trade caused the death of six hundred Brazilian citizens, mostly civilians bound to the Eucharistic Congress at São Paulo. The ruthlessness of the attack brought home to Brazilians the crude reality of totalitarian warfare, and a wave of indignation swept over the country. Brazil, consequently, recognized the existence of a state of belligerency between herself and Germany and Italy. Brazil, like the United States on the eve of Pearl Harbor, was not prepared for war; but the brutality of the Axis attack left no room for hesitation as to the necessity of participating in a war which no longer was far from Brazilian shores.

It is well known that economic mobilization should come before military mobilization. Germany, Japan, and Russia were economically mobilized, and therefore had a military advantage from the beginning. England, France, and the United States, on the contrary, had given no thought to economic mobilization, and had to improvise everything. Consequently their armed forces had to fight under visibly unfavorable circumstances.

Brazil is just beginning to mobilize her economy. We too have had to improvise everything under adverse conditions. We cannot forget that Brazil is the only country in the world which, with a large manufacturing industry and a merchant marine—the importance of which for national defense needs no stress—has insufficient sources of power and fuel. It is obvious that without fuel an industrial organiza-

tion cannot be operated. Without fuel there cannot be transport facilities, mining, or agriculture. One can say that fuel is the cornerstone of the economic structure of a country.

Therefore, when speaking of the economic mobilization of Brazil we are bound to think, first of all, of fuel, the domestic production of which, as we have said, falls short of our needs. We already have gas rationing in Rio de Janeiro. São Paulo came close to a stoppage of gas service. Light and power in Recife, one of the most important industrial centers of Brazil, are provided by a thermal power plant; at the beginning of last August the oil shortage brought this so near the end of its fuel supply that the local factories were threatened with a shutdown.

Lately, vegetable oils (specially castor oil and cottonseed oil) have increased extraordinarily in price, because the Diesel-motor-driven vehicles are using them in the shortage of imported mineral oil. Ordinary alcohol has become three or four times dearer—being burnt, mixed with ether, by the few motorcars still permitted to run. Regular supplies of alcohol are no longer received at the pharmacies, in spite of Brazil's alcohol production being one of the world's largest.

A few months ago, owing to coal shortage, the Central Railway of Brazil (*Estrada de Ferro Central do Brasil*), which is our most important railroad, was compelled to cut down 75 per cent of its traffic. It had been carrying only meat, milk, and firewood. There is, for instance, a shortage of meat in Rio de Janeiro, where very few butchers get meat supplies every day. The volume of manganese ore transported by the Central Railway of Brazil for export to the United States has shown alarming reductions.

Electric power has fallen below normal requirements, and consequently cannot make up for the lack of fuel. Thermal power plants, which form a large proportion of existing plants (many, like that of Recife—one of the most im-

portant—work with imported fuel oil), are not the only ones to be affected by the shortage of fuel. The deficiency is felt also by hydroelectric plants, which cannot obtain the equipment necessary to enlarge their present installations. According to a recent Report of the National Council of Water and Power: "Briefly, only in 25 out of 2,613 towns in Brazil served by electric power, can industries be established without consideration to locally produced energy. In 1934, out of 1,176 firms in existence, only 13 belonging to the light concern were still in a position to supply extra electric power. The remaining 1,163 are unable to generate more than the present output. In about 1,700 places now served by electric power it is impossible either to increase the existing lighting facilities or to improve street illumination."

Brazil ought to find in electricity the solution for her deficiency of fuel oil and coal. Electricity, however, makes only a minor contribution to the total of calories consumed in Brazil, ranking after imported fuel oil and coal. About a million and a half tons of coal is produced yearly in the country, most of it by the Rio Grande do Sul mines. It is a low-grade coal, not properly treated for consumption. To replace all imported coal (about a million tons), about four million tons of this would be necessary. There would be no transport available for such coal, and attention should be called here to the fact that Brazil's foreign trade in normal times has amounted only to ten million tons.

In 1940, twenty-one and one-half trillion calories, consumed in the country, were obtained from fuel oil, Brazilian coal, and imported coal. Foreign coal contributed eight trillion to that total, Brazilian coal six trillion, and fuel oil, all imported, seven trillion. Water power contributed only two trillion calories; namely, 10 per cent of the total. We ought to use electricity now for heating air, liquids, metals and for steam-producing. But there is no electricity

available at the moment. We have been compelled to ration lighting in order to make up for our needs of power, as in 1943 there will not be any available surplus of electricity. In the last ten years, power consumption in Brazil has increased over 300 per cent. The present situation cannot be remedied without importation of the equipment needed to enlarge the existing facilities. Enlargement of Brazilian power plants would involve a large consumption of plates, sheets, tubes, and so forth, not yet produced in the country, but which could be produced within a few months if a few Bessemer and electrical furnaces and rolling mills already ordered by Brazil in the United States could receive the necessary export licenses and shipping priority.

Within a year the coke plant of the Volta Redonda Iron and Steel Works will be in operation. It will consume high-quality coal from Santa Catarina mines, transformed into coke and replacing imported coke. The production of the Santa Catarina mines is about 300,000 tons, and mining industry there is not yet organized. We ought to get from those mines, by the end of the first half of next year, over 1,000,000 tons. In order to obtain such results rails, steam-shovels, and like equipment are required.

Brazil has comparatively little high-grade bituminous coal but, on the other hand, has numberless deposits of peat and lignite which can be easily exploited. Practically nothing has been done in this direction. The British-owned public utility concerns in Brazil have so far favored the importation of British coal; but shipping difficulties now cause them to seek native sources of supply. The Brazilian situation with regard to peat and lignite is very much like that of Czechoslovakia and Germany. Brazil has no high-grade bituminous or anthracite coal, and the utilization of low-grade fuels is therefore imperative.

Besides peat and lignite Brazil has large deposits of oil shale; and Manchukuo, Scotland, and Estonia have already

derived great benefits from the industrialization of shale deposits. Our fuel-oil problem could be partly solved by the thorough utilization of shale deposits such as those of Tremembé-Taubaté (São Paulo) and Maraú (Bahia). Along with this would go the increase of production of petroleum at Lobato (Bahia) and transportation of Bolivian petroleum by the Brazil-Bolivia Railway, now under construction. Bolivian petroleum might perhaps be brought to Brazil also by a cement pipe line, the construction of which is now being studied. The importation of Venezuelan and Peruvian petroleum has been recently carefully considered. The tributaries of the Amazon which flow from those countries may become channels of the new trade.

There are oil-shale deposits all over the country, so that refineries may be established in several centers of production, avoiding the same mistake made in our alcohol production, which is centralized in two places (Pernambuco and the state of Rio de Janeiro), seriously hampering the economy and even the defense of Brazil. At present there is a relative surplus of alcohol in Pernambuco (Northeast), while in São Paulo (South) it is more and more scarce. However, our alcohol output could be greatly increased by the utilization of other raw materials, such as manioc, of which Brazil is the second most important producer in the world.

We are convinced today, however, that every day that goes by renders even more serious the problem that we have to face in Brazil. Experience has proved that a country acts only when pricked by necessity. Nobody argues any longer that Brazil can make great advances in laying the definite foundations of her future economic structure, as soon as all her energies are unified for that end. Government, armed forces, industrialists, and people in general will gladly endure the sacrifices which may be imposed upon them for the attainment of this goal.

Immediately after Brazil entered the war, President

Vargas appointed João Alberto Coordinator of Economic Mobilization with full powers to act. The Coordinator holds powers similar to those with which Donald Nelson, Milo Perkins, Leon Henderson, and Paul McNutt have been entrusted. On his return from Canada, where he had represented Brazil as Minister Plenipotentiary, João Alberto had already been made head of the Brazilian Commission appointed to work jointly with the American Technical Mission under the eminent engineer Morris L. Cooke, which had been sent to Brazil by President Roosevelt at the request of President Vargas, in order to hasten the readjustment of Brazilian economy to wartime conditions. Owing to his association with the American Technical Mission, the Coordinator disposes of a first-class staff of experts. João Alberto is an old fighter, one of the most complete and enterprising Brazilian statesmen. In his new functions he has in mind just one thing: to win the war.

The nature of the Brazilian transport system, the effects of submarine warfare were felt much more in Brazil than in the United States. The country has been cut asunder. The North is connected to the Northeast only by sea. Communication between the Northeast and the central part of the country is almost exclusively by coastal waters, and very little can be expected in the immediate future from navigation of the river São Francisco, although strategic and economic reasons may later make it one of the most important lines of communication. Central Brazil is connected with the South by a motor road and a single-track railway. The carrying capacity of that railway has been used to its limit, and new equipment, especially new rails, are needed for rehabilitation.

In the present circumstances, the food supply of the civilian population—to say nothing of the armed forces—is a serious problem; and because of the lack of transport important districts have to rely on others for primary food-

stuffs. The North and the Northeast are not self-sufficient. Maranhão, for instance, ran extremely short in October. A long spell of dry weather in Ceará caused famine among large masses of population. At Natal, in Rio Grande do Norte, the same difficult situation has occurred. In cities along the Amazon, well known for the abundance of fish, a shortage of cured fish has occurred, from lack of salt for curing. The manufacturing plants in the central and southern areas depended on raw materials from the northern and northeastern areas (rubber, textile fibers, vegetable oil seeds, and nuts). It is hard to get coal from the South now that the shipping situation has deteriorated. The same applies to salt from the Northeast. Another difficult problem is the distribution of imports from the United States, even of the smaller amounts.

The war has proved once for all that one of the main problems of Brazil is the lack of transport caused by our deficient fuel industry. The fuel problem should be tackled at the earliest possible moment. We use most of our limited shipping space to import coal which can be produced at home. And yet the country's coal consumption is under 2,500,000 tons a year, that is, less than a sixth of the amount consumed in New York City.

Coal is nevertheless one of our major problems; but the economic problems of a country are all interrelated, and any solution of one of them must affect all the others. Experience has revealed that many of our problems still await solution because they have been dealt with independently. As for petroleum, of course it is now established that we have it in appreciable quantities; but, unfortunately, the drilling materials required for its efficient exploitation are very difficult to obtain from the United States at the present moment. It is to be hoped that the United States will to a certain extent reconsider its position, supplying Brazil with at least a minimum of materials which will in the end con-

tribute to relieve the shipping situation, making possible for us use of our own oil. The alcohol problem is related to that of fuel and that of the chemical industry. How to settle it if one neglects transport, the very transport which it sets moving?

It should be stressed here that the present war caught Brazil just when her industrial life was undergoing a rapid development. As we have seen, she still depended on foreign supplies of metals, fuel, and most of the basic chemical products. Those materials are essential to the country, and without them its national economy will be asphyxiated.

Today, only one country is in a position to supply them to Brazil—the United States of America; but that country also is at war. The United States needs the same materials in ever increasing quantities for the fulfillment of its own war program, and can spare very little for export. On the other hand, a quick transformation of civilian industry into war industry is now taking place in the United States, since the armed forces of the United Nations had to face great odds as a result of enemy offensives in Egypt, Russia, and Asia. This fact created psychological conditions which are notoriously opposed to any export of vital materials. The recent announcement of the opening of a second front brought an aggravation of this tendency against exports of essential materials from the United States to foreign destinations.

Another indication of the seriousness of the situation is the shortage of space for shipping regular amounts of materials to Latin American ports. This would have constituted a baffling problem even if the vital materials needed by the other South American countries had been abundant and if their exportation had been easy to arrange.

This situation may become worse in the future. The manufacturing industry of Brazil, however, cannot be paralyzed all at once. It may not continue at the same rate of growth,

but obviously its basic activities must continue if a disastrous breakdown is to be avoided.

An analysis of the present industrial organization of Brazil will indicate that the urgent needs of this country must be supplied, so as to relieve its present difficulties somewhat. Basic materials are required for the solution of this threefold problem—fuel, transportation, and heavy chemicals; and all these depend on metallurgy. No country as yet has been able to solve those problems without resorting to metals, because it is impossible to create a considerable industry of machines, tools, and specialized equipment without a metallurgical background.

Brazil already has developed a metallurgical industry; and its production can be not only increased in volume but improved in quality, provided it is given the means of diversifying its activities. At present, numerous plants in the United States are paralyzed, and many of their machines and tools would be a precious addition to the Brazilian industrial organization. Brazil is willing to buy them.

Brazil needs rails and other steel and iron products, such as sheets and plates, for the upkeep of her communication systems. She needs metals in order to build new distilleries of alcohol, which, with the existing shortage of gasoline, is a tentative, partial solution to the problem of fuel. It should be pointed out that 40 per cent of the motor vehicles in the country are trucks. By a governmental decree, private automobiles have not been permitted to run anywhere in Brazil since July 15. And again, she needs metals to set up factories for such basic chemicals as caustic soda, chromates, pigments (coloring materials), soda ash, methanol, and ammonia, which are indispensable and have no substitutes.

About 35 per cent of normal needs of the Brazilian market is already met by our iron and steel industry. A better result could, however, be achieved with an accurate plan for utilizing this production. Within two years the Volta

Redonda Steel and Iron Works will be in operation. This will alter the present situation fundamentally for the better. It is obvious that our imports should consist, from now on, only of iron and steel products not yet manufactured in the country.

The manufacture of alcohol not only provides a fuel but makes possible a rich variety of chemical by-products widely used throughout the industrial field; and this fact alone should encourage its development and testify to its necessity. Hitherto, the Brazilian production has consisted only of ethyl alcohol; and the output has not been as large as it should be in a country whose cane-sugar production is the second largest in the world.

The fermentation industries in the country are in their infancy. It is obvious, as said above, that numberless chemical products could be manufactured in Brazil if a proper and varied manufacture of alcohol existed; but the country has been importing most of these products, and on an increasing scale.

As to an alkali industry, nothing has been done yet in Brazil, and soda ash and caustic soda are an ever present problem. It is known that sodium is one of the pillars of any industrial superstructure. In raw materials we have all that is required for establishing this industry in Brazil; and by doing so we would not deprive the United States of one of its markets, since the supply of this material has always been handled by "Duperial," a British-American subsidiary of Imperial Chemicals, of England. In present conditions, this firm has not been able to maintain its regular supplies to Brazil. Consequently the prices in Brazil have increased tremendously in the last year or so, while the supplies tend to become scantier. Brazil is just beginning to produce its own plate glass. But the difficulties in the way are enormous as she has no soda ash and there is no easy way of solving the shipping problem. Just now, two of the most important glass

factories in Brazil are threatened with closing for lack of that basic product.

Obviously, Brazil cannot solve the crucial problem she faces—namely, shortage of fuel, of means of transportation, and of chemical products—without metals to carry out a program of building up her economic structure.

The United States is not in a position, however, to supply Brazil with the metals required for that purpose. Brazil's mineral resources are among the largest in the world. This book tries to explain why Brazil has not developed a mining industry in accordance with her possibilities. The present war has been called a war of production, and Brazil's contribution to it, so far, has been mainly in this field. There is in the United States an increased demand for copper, iron, manganese, rock crystal, beryllium, mica, lead, zinc, zirconium, titanium, chromium, bauxite, alumina, and tungsten. Brazil already produces some of these minerals and is increasing her output to meet United States orders. To a certain extent, processing of such minerals in the country will save shipping space, a vital condition of World War II. A metallurgical industry well developed is the backbone of undertakings of this nature. Without it, Brazil's industrial capacity will be soon exhausted, and we shall continue to drain from the United States elements which could be better used on the fighting fronts.

In short, Brazil suffers at the moment from four hungers: metals, chemicals, fuel, and transport. Her abundant mineral resources will procure Brazil the metals, provided that she can get the equipment to produce them. With metals, Brazil will solve by herself—at least momentarily—the other three problems. If the implements of production are made available to Brazil, she will be able to place her limitless resources in the first line of the great battle of production. This will be an industrial alignment, supplementing the political one, of two of the greatest countries of the Western

Hemisphere. It will constitute a new source of strength to nations engaged in a mortal struggle against the forces of darkness and will cement indestructibly the foundation of future economic collaboration between the Americas.

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